TECHNOLOGY DEPT.

TELEPHONE ENGINEER

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DETROIT

AND MANAGEMENT

The National Telephone Magazine

FEBRUARY 15, 1942

Wire Chief's Training Course . . . Quantitative Design . . . Minnesota Convention Report . . . Personals . . . Highlights of Communications News . . . Line & Desk . . . Long Lines

LEICH SERVICE
LEICH
P.B.X's
GUARD THE
OUTPOSTS OF
SERVICE . . .
Significant is the fact that Leich P-B-X's are going into many new Defense plants. Modern, rugged, dependable; they are ideally suited for the job. Here, where service demands are heavy and operating supervision and equipment maintenance must necessarily be limited, their sturdiness proves its value. Line, trunk and cord circuits are available to meet virtually every operating condition. Specifications and detailed information furnished upon request.
Leich Sales Corporation

GUARD THE OUTPOSTS OF FREEDOM

427 West Randolph Street Chicago, Illinois

MANY OWNERS OF SMALL EX

IMPROVED SERVICE

EASIER SWITCHED SERVICE

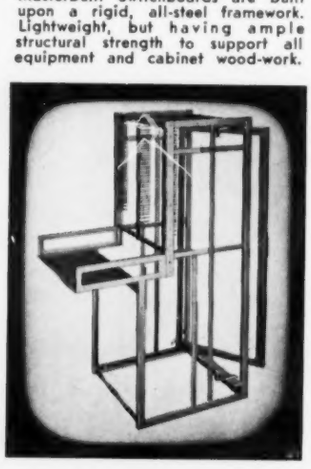
LESS EXPENSE

MORE SUBSCRIBERS

HIGHER RATES

BETTER INCOME

FOUNDATION OF STEEL! Kellogg Masterbuilt Switchboards are built upon a rigid, all-steel framework. Lightweight, but having ample structural strength to support all equipment and cabinet wood-work.



EXCHANGES HAVE FOUND THE WAY TO *Better Profits!*

IT'S NO coincidence that a great many *successful* small exchanges have Masterbuilt Junior Switchboards. For the Masterbuilt Junior was born with one purpose in life . . . and that, *to enable the small exchange owner to show a healthier profit at the end of the year.*

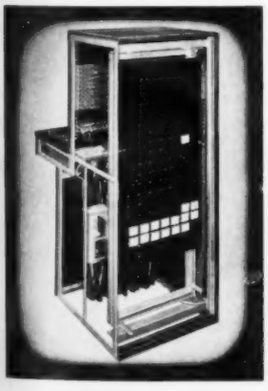
With it you can furnish either common battery or magneto service—or both at the same time! And, like in other towns, the majority of your subscribers want the improved service that common battery brings because it means no more cranking to ring central, no ringing off, and no more weak or dead dry cells to impair conversations. Instead, it assures speedier, more efficient service, simplified operation, immediate operator attention and better transmission. All of these make for greater use of the telephone, more toll calls, and more new subscribers.

Any wonder why the common battery idea continues to spread so rapidly? Your subscribers, too, want this "big city" service, and will pay you more for it. Yet, the flexibility of this board provides for maintaining your present rates for the comparative few who may wish to retain magneto service. It's easy to change over one or more lines at a time from magneto to common battery, by simply switching the line connections at the switchboard. And this entails no extra switchboard expense whatever!

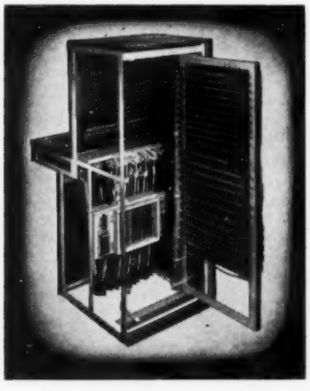
It costs less to furnish common battery service. Talking and ringing current can be supplied for as little as 10 cents a year for each common battery station. Think what you can save every year on this one item alone!

The Masterbuilt Junior is priced in the magneto switchboard class, but it can make profits for you that no magneto switchboard *ever could*. You owe it to yourself to investigate it *now*. Kellogg Switchboard and Supply Company, Chicago.

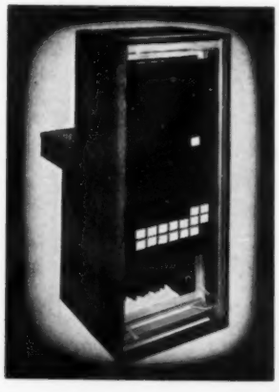
SIMPLE AND RUGGED! Typical of Kellogg design and construction, the Masterbuilt Junior assures many years of trouble-free service. Easier to operate than might be imagined.



NEAT AND ROOMY! All of the equipment in the Masterbuilt Junior is positioned and spaced for easy accessibility. No crowding, no obstructions; everything most conveniently arranged.



READY TO SHIP! Masterbuilt Junior comes completely set up, wired and tested in the Kellogg factory. Simply connect cable to the main frame, and the installation is done.



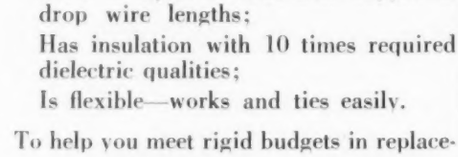
KELLOGG

EXTRA EDITION

Telephon

An Advertisement of Leading Supply Manufacturers Whose Produ ts Are

PHONE MEN DEPEND ON



Ironite The Better Drop Wire

War time economy proves Ironite. In the last war as in the present it has demonstrated its value as a conserver of vital war materials. At the same time it meets all demands for efficient, satisfactory service. Ironite Drop Wire—

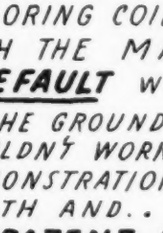
Is unusually strong—resists sleet loads on long spans;

Has high conductivity—Ironite #18 BWG is equal to #22 B&S copper in drop wire lengths;

Has insulation with 10 times required dielectric qualities;

Is flexible—works and ties easily.

To help you meet rigid budgets in replacements you will find Ironite most reasonably priced. Specify Ironite Drop Wire for good service and low cost.



ODD.....BUT TRUE !

DROP WIRE THAT IS ENCASED IN STONE
THE BRAID ON IRONITE DROP WIRE IS COVERED WITH POWDERED MICA... OR STONE
"IT CAN'T BE DONE"
THE PATENT APPLICATION FOR THE EXPLORING COIL FURNISHED WITH THE MATTHEWS TELEFAULT WAS REJECTED ON THE GROUNDS THAT IT WOULDN'T WORK. A PRACTICAL DEMONSTRATION PROVED ITS WORTH AND.... A PATENT WAS ISSUED
THE SAME SULPHURIC ACID USED IN A STORAGE BATTERY IS USED IN THE PROCESS OF CHANGING AN ORDINARY PIECE OF WOOD INTO AN EDIBLE CARBO-HYDRATE
STARCH
STARCH

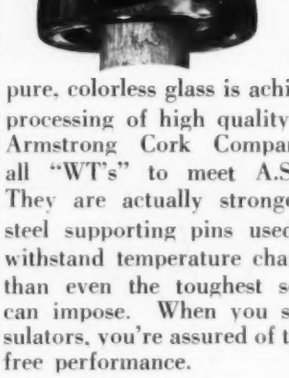
Indiana Crapo, High Strength Line Wires Lower Line Costs

The new high-strength line wires made by the Indiana Steel and Wire Company cut costs in line construction because of the longer spans which they make possible. Crapo HTL-85, High-Tensile, Low-Resistance Line Wire permits 225 foot spans in heavy loading districts. Crapo HTL-135, of still greater tensile strength, permits spans to 350 feet in heavy loading areas. These new line wires cut costs of new construction and provide stronger spans with less maintenance on existing lines. They reduce the number of poles required and make line extensions more economical and profitable.

Large and Small Phone Companies Use RectiChargeRs for Best Battery Charging

The Raytheon RectiChargeR is the preferred constant potential battery charger for telephone service. It has been accepted by both large and small companies because of its complete reliability. These users have found the RectiChargeR to be capable of developing maximum battery life, insuring best telephone operation and well suited for operation at unattended locations. Some storage battery manufacturers even increase the life guarantee of their batteries when they know that RectiChargeRs are to be used.

Sharpshooters Are Foiled By Colorless "WT" Glass Insulator



Thanks to the low visibility Whitall Tatum Glass Insulators are difficult targets for mischievous sharpshooters and rock throwers. The pure, colorless glass is achieved by precision processing of high quality ingredients. The Armstrong Cork Company manufactures all "WT's" to meet A.S.T.M. standards. They are actually stronger than standard steel supporting pins used in tests. They withstand temperature changes more severe than even the toughest service conditions can impose. When you specify "WT" Insulators, you're assured of top-notch, trouble-free performance.

...me Facts

EXTRA EDITION

...se Prod... ts Are Distributed by the Kellogg Switchboard and Supply Company

...N KELLOGG LINE SUPPLIES

Bartlett Tree Trimmers Have Drop-Forged Blade That Stays Sharp — For Quick Clean Cuts

The most important thing to look for in a tree trimmer is a blade that will stay sharp even under heavy duty. That's why telephone men like this Bartlett Tree Trimmer so well. The special drop-forged, tool steel, side-cutting blade *holds its edge.* The Bartlett No. 1-W Tree Trimmer is easy to use, light in weight and assures quick, clean cuts. The 9 to 1 ratio of the compound lever and pulley design and the positive return of the blade to full cutting position assure fast, efficient work. Specify Bartlett Tree Trimmers.

LIGHTNING ARRESTERS OFFER SCORES OF EXCLUSIVE FEATURES

The Cook No. 7 Lightning Arrester, equipped with non-grounding Tru Gap Dischargers, is an outdoor arrester combining scores of functional and construction features found in no other lightning arrester. Ten wire capacity, for mounting on pole or cross arm; will shunt to ground high potentials included on open leads. Provides protection to cable from exposed drops connected to unprotected terminals. Installed on open leads near their connection to a protected pole cable terminal the No. 7 Lightning Arrester will prevent excessive fuse operation.

Chance Pike Pole points are removed, replaced or reversed by simple spring release - - -

Worn, damaged, unsafe pike points can be removed from the ferrule on the Chance Pike Pole by simply releasing the thumb spring and replaced by a new point. No need to buy complete new heads or pike poles. The point can be inserted point first so only a blunt end protrudes. Reinforced at base. Laquer finished.

Nicopress Splices Equal or Exceed Breaking Strength of Conductors

When the fastest, eaiest way to do a job is also the best way, there's no reason to do otherwise. That's the situation with regards to splices made the Nicopress way—for every line joint made with Nicopress sleeves and tools will . . . (1) equal or exceed the rated breaking strength of the conductors; (2) be tight as a weld; conductor will not pull out; (3) have high conductivity; (4) be easily made either in the air or on the ground. For improved efficiency all along the line—the Nicopress method has proved the answer.

Excellent Service, Quality Materials, Build Kellogg Reputation

It is interesting sometimes to find out why people buy things where they do buy them. Why, for instance, do thousands of telephone men continue, year after year, to make Kellogg their headquarters for line supplies?

The reasons are varied, of course, but there's one deep-rooted factor that seems to be most important. That is *confidence.*

Telephone men have learned that Kellogg promises are made to be kept. That if a carload of poles is needed, Kellogg will do everything in its power to see that the poles do arrive on the date specified.

This confidence that telephone men have in Kellogg's ability to serve them has been developed by years and years of close cooperation. When Kellogg puts its mark of approval ("Double Guarantee") on a new line supply item, phone men know for certain that they aren't taking any chances when they purchase that item for the first time.

So, when telephone men realize that they will always get the finest quality materials; when they *know* they will be charged fair prices, when they are sure that they will be sent the right material to the right place at the right time . . . that is *confidence.* And this confidence in Kellogg's understanding and handling of their orders is one of the main reasons why so many telephone men say—"Order it from Kellogg."

COPPERWELD WIRE REQUIRES 30% COPPER

BRONZE WIRE REQUIRES ALMOST 100% COPPER

Telephone companies everywhere are saving copper — and dollars — with

COPPERWELD NO. 18 DROP WIRE

No. 18 Copperweld is now the standard drop wire for the country's largest telephone companies. **No. 18** Copperweld Drop Wire, using only 30% of the copper required for bronze wire, also saves rubber—because of its smaller conductor diameters. **No. 18** Copperweld Drop Wire provides ample conductivity and breaking strength. Each **No. 18** Copperweld wire has a minimum breaking strength of 170 pounds and each wire provides 30% of the conductivity of a solid copper wire of the same diameter.

Save copper, rubber, and dollars with **No. 18** Copperweld Drop Wire. It costs less. Buy it* from American Automatic Electric Sales Co., Graybar Electric Co., Kellogg Switchboard and Supply Co. or Stromberg Carlson Telephone Manufacturing Co.

**No. 17 Copperweld Drop Wire and Copperweld Telephone Line Wire may also be obtained from all of these distributors.*

COPPERWELD

NON-RUSTING

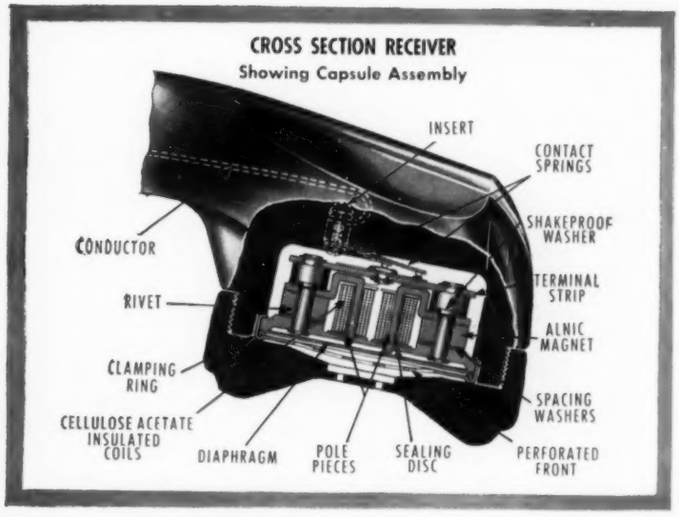
TELEPHONE PRODUCTS

COPPERWELD STEEL COMPANY · GLASSPORT, PA.

Entered as Second Class Matter at the Post Office at Pontiac, Ill., under the Act of March 3, 1879.

Humidity — CAN "GET TELEPHONES DOWN"... AS WELL AS MEN

The Units and Parts Used In The *NEW* Stromberg-Carlson Handsets Are Practially Impervious To Humid Climates.



Every telephone man knows the effect of humid conditions on most telephone receivers and transmitters. Immunity to humid conditions is but one of the many constructive features of the new Stromberg-Carlson No. 1222 Handset Telephone.

Take the receiver as an example. The coil windings and insulations are made of materials specially selected to minimize electrolysis caused by humidity. Metal parts are selected or treated to prevent corrosion. Thus the harmful effects of moisture are practically eliminated and trouble-free operation is assured under all conditions.

The new Stromberg-Carlson Handset Telephones contain many new features which make them the logical selection for central energy operating exchanges.

May we send you full particulars?

STROMBERG-CARLSON TELEPHONE MANUFACTURING CO.
Factory and Gen'l Offices: 100 Carlson Rd., Rochester, N. Y., U. S. A.
Branch Offices: Chicago Kansas City San Francisco Toronto

Stromberg-Carlson

MAKERS OF VOICE TRANSMISSION AND VOICE RECEPTION APPARATUS FOR FORTY-SIX YEARS

TELEPHONE ENGINEER

MANAGEMENT • ENGINEERING • MAINTENANCE

"THE NATIONAL TELEPHONE MAGAZINE"
FOUNDED 1909

VOLUME 46—NO. 2
FEBRUARY
1942

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Selected by 86% of the Operating Companies

COFFING
Safety Pull
HOISTS

It's little wonder that the big majority of operating companies select Coffing Safety Pull ratchet lever hoists, because they are the safest built—the only ones equipped with a dual ratchet and pawl assembly independent of each other.

The handle is always under control —it cannot slip or drop low.

Then, too, Coffing Hoists are the lightest on the market. While capacities range from ¾ to 15 tons, the units weigh only from 14 to 150 pounds.

Write for illustrated literature.

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Hemingrays Will Outlive Your Poles, Crossarms, etc.

PROOF of it is furnished by a well-known utility (name on request) who report that *today they are using thousands of Hemingrays purchased 50 years ago!*

REASON for it lies in secret Hemingrays glass "batch-mix" and Owens-Illinois production-control that results in insulators free of voids, strains and stresses . . . so homogeneous that they are unimpaired by sudden temperature changes . . . impervious to moisture-penetration from all sources.

COST? Low to begin, *lower* in service-life. Hemingrays are sold *only* by principal jobbers.

11 Hemingrays Cover All Line Needs

Favorite for rural-line operation is Hemingrays Number 9, with drip point petticoat for fast moisture run-off. Number 16 with its double groove. Number 42 with long leakage path giving trouble-free "toll" service. Ask for samples.

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ACROSS THE Editor's Desk

We were in the midst of three or four headaches recently caused by small errors of omission in our BLUE BOOK Number when the postman saved the day. It's funny how a bright cheerful note can cause so much pleasure—and especially so when you have that "down" feeling. Anyhow, the first letter was from a Philadelphia reader who wrote as follows: "The writer, a purchase man for the Federal Government, took a hasty glance at your BLUE BOOK issue, and sincerely congratulates you. It is a job, very well done. No doubt many have previously told you so."

He continued "I wonder if you could possibly dig up a copy and mail it to the undersigned. Will gladly send you postage necessary. I am sure it would assist in the daily routine." And we have only to send a copy for such a cheerful letter. It is yours, Sir!

▲

While we are acknowledging letters we might thank William A. Rucker in the Signal Service (AVN) at March Field, Calif., for his decision to subscribe instead of borrowing his TELEPHONE ENGINEER each month. What we really liked was his postscript "Thanks for all the good reading."

▲

State conventions will be in full sway starting in March and we urge all telephone men to attend the convention in their state this year. You will find it almost a necessity to keep up with the times and your business.

Ray.

WAR EFFORT DEMANDS ECONOMY!

Get maximum use of your old telephones by rebuilding them the AR way. Desk stands completely rebuilt and blanked for dial — only $4.00 with your old set.

Help the war effort and prepare for the coming of automatic service at low AR prices. Or send any of your old equipment for rebuilding for any type of service. Remember, AR rebuilt means factory reconstructed inside and out by expert craftsmen. . . . If you have no trade-ins, we'll send you AR rebuilt instruments from our stock. Write for prices.

THE MARK OF QUALITY in REBUILDING SERVICE

AUTOMATIC ELECTRIC

ORIGINATORS AND DEVELOPERS OF STROWGER STEP-BY-STEP MACHINE SWITCHING AUTOMATIC DIAL SYSTEMS

MAKERS OF TELEPHONE, SIGNALING, AND COMMUNICATION APPARATUS — ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS

Distributors in U. S. and Possessions:
AMERICAN AUTOMATIC ELECTRIC SALES COMPANY
1033 West Van Buren St., Chicago, U. S. A.

BACKED BY 49 YEARS OF EXPERIENCE

Model No. 33

Model No. 6

For almost half a century the name of "Calculagraph" has stood for guaranteed satisfaction in making an immediate, accurate and permanent record of every toll message.

To score 49 years of success, you know the product of a manufacturer must have genuine merit—know that the manufacturer must give users a square deal.

Naturally, we are proud of our record. That just pride makes us jealous of the good reputation of the Calculagraph.

It compels us to be careful of that reputation —to make sure that every Calculagraph which leaves our plant is worthy of its name and deserving of your confidence.

There are two models which print elapsed time to the second on standard toll tickets, and one eight-day spring-drive model which prints time in minutes and quarter minutes, with five-second indications.

Write for our interesting information

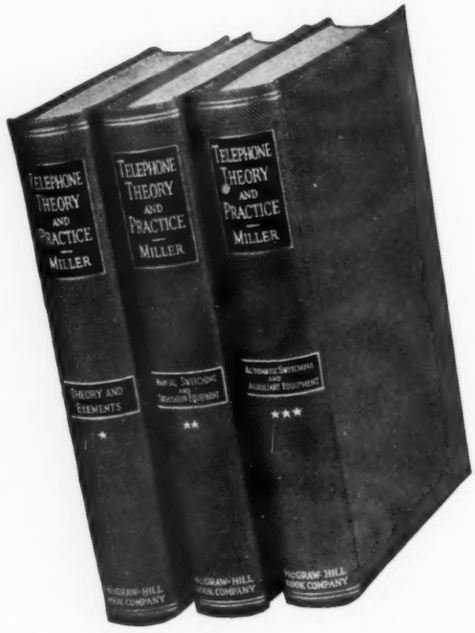
CALCULAGRAPH CO.
308 SUSSEX STREET HARRISON, N. J.

CALCULAGRAPH
Accurate Toll Timing to the Second!

This Set of

BOOKS

Should Be In Every Telephone Man's Library



A complete treatise on telephony

Here are three books that can be obtained together or separately which give a complete treatment of telephone practice, covering everything from single fundamentals of telephone science and theory to construction and operation of technical equipment and apparatus used in telephony. Features of these books are the clear, understandable treatment; the simple language employed; and the profuse illustrations with drawings and photographs of actual apparatus and circuit diagrams.

TELEPHONE THEORY and PRACTICE

by KEMPSTER B. MILLER, Consulting Engineer

VOLUME I
Theory and Elements
486, pages, 6x9, 272 illustrations, $5.00

VOLUME II
Manual Switching and Substation Equipment
439 pages, 6x9, 287 illustrations, $5.00

VOLUME III
Automatic Switching and Auxiliary Equipment
494 pages, 6x9, 287 illustrations, $5.00

ORDER TODAY from

TELEPHONE ENGINEER
7720 Sheridan Road — Chicago

They're out there on skis in beating blizzards . . .

WHETHER the snow is four inches deep, or forty feet, the wires that link America from coast to coast must go on functioning. Communication is America's nervous system. The hardy men who keep the calls flowing are nerve specialists. No storm can stop them, no flood, no hurricane and no blizzard.

It is a telephone tradition to keep the calls coming through. And since 1895, Exide Batteries have faithfully served the great system which makes neighbors of a nation, helping maintain a tradition of service in routine and emergency alike. There's an Exide ready to do the job, whether common battery, emergency reserve, signal, or P.B.X. . . . in small or large exchanges.

FOR DEFENSE BUY UNITED STATES SAVINGS BONDS AND STAMPS

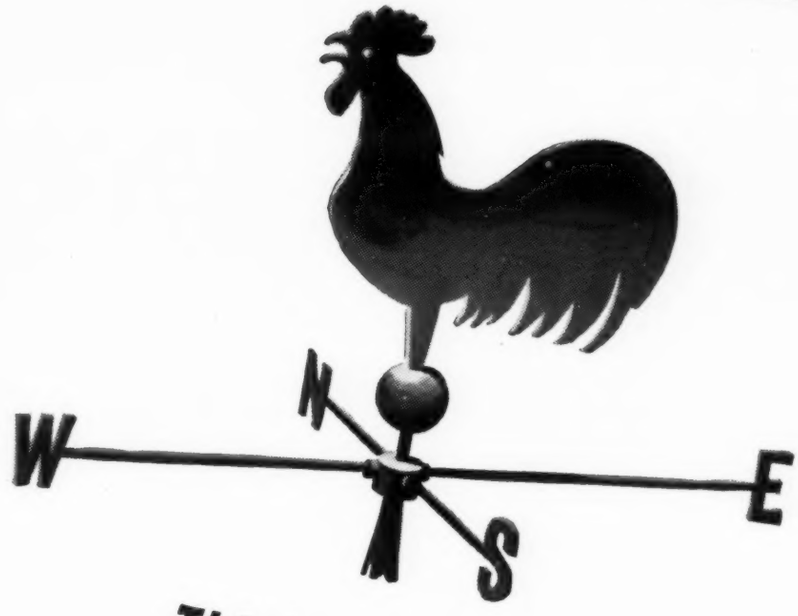
Exide
TELEPHONE BATTERIES

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

It's a Farm Problem, too

THE advertisement on the opposite page appears in farm publications during January and February. It is typical of other advertisements being addressed to telephone users everywhere.

This is the kind of message which makes for understanding and enlists the co-operation of the public in these critical times.



Thick and fast from all directions

A stockman is on the wire. He has several carloads of lambs in the feedlot and needs more shelled corn. A commission firm is getting in touch with a farmer about an offer on some steers.

A poultry specialist is having trouble with birds going off feed and wants to talk with a nutrition man right away.

That's the way calls are coming in these busy days — thick and fast from all directions.

We are handling an average of 85,000,000 telephone calls a day and that's an all-time record. The telephones are busy because you and your neighbors, farm and factory, are producing as you never have before.

It takes a lot of conversations to get things done. It's a big job and the whole Bell System is doing its best to meet the heaviest demands in history on telephone service.

BELL TELEPHONE SYSTEM

An Advertisement of the Bell Telephone System

TAKE A TIP FROM AN ENGINEER

DANIEL SEITZ, *well-known telephone engineer, says:* "To maintain uniform transmission, always select dry batteries which sustain their voltage at a high level throughout their useful life."

EXPERIENCED TELEPHONE MEN *know* that "Eveready" "Columbia" "Gray Label" Long Life telephone cells sustain their voltage . . . insure *peak* transmission efficiency. For over forty years, these *original* telephone cells have been noted for their outstanding performance. Developed and constantly perfected in the world's largest dry battery laboratory, they are manufactured to the highest standards.

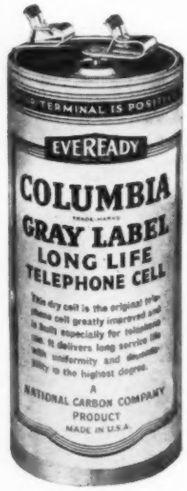
Equally important, these cells last longer, *saving money* for those who use them. These are the reasons why more independent telephone companies specify "Eveready" "Columbia" "Gray Label" Long Life telephone cells than any other brand. They are available at leading telephone supply distributors.

LET'S GO! U.S.A. KEEP 'EM FLYING!

★ **SUSTAINED VOLTAGE**

★ **LONGER LIFE**

★ **UNIFORM QUALITY**



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Unit of Union Carbide and Carbon Corporation

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General Offices: New York, N. Y.
Branches: Chicago and San Francisco

The words "Eveready," "Columbia" and "Gray Label" are registered trade-marks of National Carbon Company, Inc.

Highlights of the Communications News

Important Communications developments of the past month, briefed for busy readers

by

ROLAND C. DAVIES
Editor, Telecommunications Reports

THE telephone industry may have some of its problems in regard to service for the civilian population and to the securing of scarce metals and materials for maintenance and equipment and essential construction ironed out during the latter part of February. This was authoritatively indicated by important governmental sources to the TELEPHONE ENGINEER.

While the large Army construction program for the building of new camps and airfields to take care of the greatly expanded military forces is still in the final stages of preparation to a major extent, the telephone industry, Bell System and Independents, will be called upon in a month or so to tackle this task of construction and installation of facilities. Of course, construction of telephone plant for the military services will receive high priority ratings for the materials and metals required.

WPB Branch Functioning

THE Communications Branch of the War Production Board, headed by Leighton H. Peebles, has commenced to function in a most satisfactory manner which promises good results for the telephone industry. Not only is Mr. Peebles and his executive staff handling telephone matters laying the groundwork for the industry's allocations and priorities blueprint in an adequate manner so as to keep the telephone service functioning in the most efficient manner possible but the entire WPB leadership, including Chairman Donald M. Nelson, Industry Operations Chief James S. Knowlson, former Radio Manufacturers Association President, and Philip Reed in charge of all Industry Branches and chairman of the General Electric Co., is well aware of the outstanding importance of the telephone service to the War effort and the civilian population.

Assisting Mr. Peebles in the telephone field is Bruce H. McCurdy, former International Telephone and Telegraph engineering executive who was in charge of all European telephone installations, and George J. Dempsey, well-qualified FCC engineer with many years of experience in the industry, while as special advisers and consultants are Carl D. Brorein, President of the Peninsular Telephone Co. of Florida, and Richard A. Lumpkin, President of the Illinois Consolidated Telephone Co., two leading executives of the Independent industry.

Restrictions

THE first step to aid the telephone industry by Communications Branch Chief Peebles was slated to be the issuance of a number of restrictions of telephone construction activities designed to conserve strategic metals and materials. So that state commissions could advise subscribers of the war necessities of such restrictions, the WPB agency established a number of restrictions which have become generally accepted as operating practices. Among these were the banning of extension residential telephones except in the case of physicians or other imperative reasons; the termination of automatic conversions unless more practicable than manual; and a smaller future growth capacity in new cables than normally projected by the industry. **Outright rationing of telephone service is not anticipated for the immediate future and may come first in long distance service with a plan of deferred toll calls being considered as a solution to smooth out peak periods of operation.**

But it is **most important** for the industry to realize that the rationing will be formulated primarily by Mr. Peebles and his Communications Branch rather than by the New Dealer Office of Price Administration, headed by Leon Henderson. OPA has only been assigned in rationing the field of all goods and commodities sold on the retail market and any products sold to the ultimate consumer under the orders of WPB Chairman Donald M. Nelson. This was interpreted to mean that telephone service and other public utility operations would be rationed only by their specialized branches of the War Production Board—like the Communications Branch, Power by J. A. Krug's unit and transportation by Coordinator Eastman.

It is believed likely that any rationing plan for the telephone industry will NOT be established on a nationwide basis with sweeping restrictions to be placed in effect by every telephone company throughout the country. Rather it is felt that any rationing will be instituted on the basis of local or regional requirements where shortages have arisen and have become acute. This latter method follows the pattern already set in motion by the WPB Power Section, headed by Krug, and worked out very successfully in the largest instance of power service restrictions in the Southeast last November and December.

Priority

ANOTHER important development in the offing for the telephone industry is to be the issuance of a separate **Maintenance and Repair Order** for the industry. It is understood that this will provide liberal high priority ratings for the industry's repair needs and will be geared to assure the maintenance and operation of telephone facilities in the most adequate status possible. It was assured that the telephone industry, Bell System and Independents, will be given an opportunity to study this Maintenance and Repair order before its final issuance. Such a separate order would do away with the present unsatisfactory situation of the telephone industry's repair needs being grouped with all other industries in the present P-100 order.

Probe of FCC

CONGRESS is again threatening to investigate the FCC. This time the storm clouds of the probe seem to be thicker and possibly may result in the Commission's investigation which has

Telephone Timepiece

One of the cleverest of the new lapel watches displayed on smart jewelry counters is a fine seven-jewel timepiece set in a case which is a faithful replica of a modern telephone. The face of the watch corresponds to the dial on the telephone and there is a real-istic removable receiver.

been proposed practically every year since its creation in 1934, because the inquiry is sponsored by Rep. Eugene Cox, Georgia Democrat and leader of the powerful House Rules Committee.

The investigation is described by Rep. Cox as directed against the "maladministration of a good law" with the attack centered against FCC Chairman James Lawrence Fly and the New Deal coterie of young lawyers in the Commission, alleged to dictate and formulate its policies of regulation particularly in broadcasting. A chief objective seems to be to prevent the reappointment of Chairman Fly whose term of office expires next July 1. Rep. Cox characterized the Commission Chairman as "one of the most dangerous men in the Government" because he wants to "Federalize all forms of communications"—telephone, telegraph, broadcasting and radiocommunications.

The Georgia Democrat also is seeking to expose the alleged "radicals" on the FCC staff whom he claims are leaning towards Communistic views. If the temper of the House in striking at Communistic followers as exhibited in the recent onslaught against the Civilian Defense "boondogglers" is maintained, it is felt the Cox investigation of the FCC has an excellent chance of passage.

Signal Corps

THE Army Signal Corps has two new Brigadier Generals—James A. Code, Assistant Chief Signal Officer, and Roger B. Colton, Chief of the Materiel Branch in the Office of the Chief Signal Officer. Both are outstanding officers in the Signal Corps—General Code, who has risen from Lieutenant Colonel to Brigadier General in a space of four months, conducted the first remote control operations of radio by the Army and the first broadcasting in 1919 at Louisville, Ky., and General Colton had headed for a number of years the Signal Corps Laboratory at Fort Monmouth where he had much to do with the improvement of the Army's invaluable weapon of the aircraft radiolocator system.

Signal Corps Hero

AT the same time, the Signal Corps produced the greatest hero in the Pearl Harbor attack. He was Private Joseph L. Lockard, now a Staff Sergeant, who voluntarily was operating the radiolocator system on the morning of the Jap airplane attack and tried to get the warning through to headquarters. Sergeant Lockhard was awarded a Distinguished Service Medal by the War Department Feb. 10 for this devotion to duty.

Convention Dates

Texas Telephone Association, Hotel Adolphus, Dallas, March 18, 19 and 20.

Kansas Telephone Association, Hotel Jayhawk, Topeka, April 2 and 3.

Iowa Independent Telephone Association, Hotel Ft. Des Moines, Des Moines, April 7, 8 and 9.

Nebraska Telephone Association, Hotel Paxton, Omaha, April 14 and 15.

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, April 21 and 22.

U.S.I.T.A. Executive's Spring Conference, Stevens Hotel, Chicago, April 28 and 29.

Indiana Telephone Association, Claypoole Hotel, Indianapolis, May 6 and 7.

Illinois Telephone Association, Pere Marquette Hotel, Peoria, May 12 and 13.

Pennsylvania Independent Telephone Association, Sterling Hotel, Wilkes-Barre, May 21, 22 and 23.

New York State Telephone Association, Hotel Syracuse, Syracuse, May 25, 26, 27.

Wisconsin State Telephone Association, June 3 and 4 (Place to be announced later).

Missouri Telephone Assoc., Muehlback Hotel, Kansas City, Nov. 16, 17 and 18.

Labor

THE leadership of the International Brotherhood of Electrical Workers (AFL) has been attempting in recent weeks to revive its claims and efforts to perform telephone construction work in Army and Navy establishments and war production government plants where such operations are being handled by the affiliated unions of the National Federation of Telephone Workers.

The new efforts of the IBEW at present are only in a discussion stage and so far there have been no direct attempts of the AFL union to preempt the telephone construction work in the various Army establishments and defense plants. It is understood that the high War Department officials in charge of labor and communications activities favor the employment of the regular telephone workers because their performance means more efficient telephone plant construction and installation, which naturally produces less costly work.

Overtures were made by IBEW President Edward Brown to NFTW President Paul E. Griffith to permit the IBEW workers to pull telephone wires in all Army and Navy establishments and defense plants during the latter part of January at a Chicago meeting. But the presidents of the affiliated NFTW unions who were engaged in this special meeting at that time inequivocally and firmly refused to enter into any such division of telephone construction and installation work with the AFL union.

The IBEW officials again during early February in Washington asked for another conference with NFTW President Griffith when he was attending the joint session of the Industry and Labor Advisory Committees of the Defense Communications Board. At this conference the IBEW renewed its proposal that its members should perform the complete telephone work at military establishments. The IBEW suggestions again were rejected definitely by Mr. Griffith and by representatives of the unaffiliated Bell of P., New Jersey Bell and New York Telephone unions.

The renewed threats of the IBEW to **invade** the fields of telephone construction and installation seem to be totally counter to the Administration's policy of giving labor every opportunity to perform its qualified rights of work. For the telephone employees it is their life work, and the IBEW members have heretofore had few telephone activities, so the IBEW efforts actually amount to attempts to steal away from the qualified telephone employees their proper occupations. Today the preponderance of telephone construction and installation work is in the military and defense fields and this percentage is growing steadily and speedily.

Another labor union development was the disclosure that the American Communications Association (CIO) recently called upon the Postal Telegraph management to launch a joint company—union effort to seek a loan from the Reconstruction Finance Corporation for the purpose of providing funds to increase Postal wages. It was revealed that Postal Telegraph had secured last December another loan, in addition to the previous $5,000,000 grant, from the RFC to continue operations. ACA President Selly called upon the CIO and its President Philip Murray to aid in persuading the RFC to grant an additional loan.

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Wire Chief's TRAINING COURSE

SECTION XI

Drop Wire Construction—Part XI

(Prepared Expressly for TELEPHONE ENGINEER by the Lincoln Engineering School)

Drop Wire on Joint Use Poles

LET us next consider the standard methods employed in attaching drop wire to terminal poles. This is an important phase of drop wire construction and unless drop wire is neatly and uniformly attached to terminal poles, it will be both unsightly and a source of potential trouble.

The method of installing drops at terminal poles will be somewhat different for joint use poles than for non-joint poles.

Most of the larger companies use guard arms on joint use poles which carry cable. The guard arm serves the dual purpose of providing a means for spreading the drops so that there is a minimum of 30 inches of climbing space through which men working on the power wires can climb, and providing a protective guard above the grounded messenger to reduce the possibility of a power lineman standing on the messenger when working on the power wires. Where a guard arm is used the clearance between the bottom of a power crossarm and the top of the guard arm need be only 40 inches. Without a guard arm the clearance between the bottom of the power crossarm and the messenger should be 6 feet. It is generally more economical to provide a guard arm than to provide six feet of clearance on joint poles.

Figure 1 shows the clearance requirements as well as the general features of a joint lead employing guard arms.

It will be noted that the climbing space clearance must be increased from 30 to 36 inches for voltages over 8700.

Drops may be attached to guard arms either by means of house brackets and insulators or with hooks and drop wire clamps. The wire load should be kept balanced on the arm if possible.

Guard arms can be purchased direct from the supplier or made up from old crossarms. Typical guard arm dimensions are shown in Figure 3.

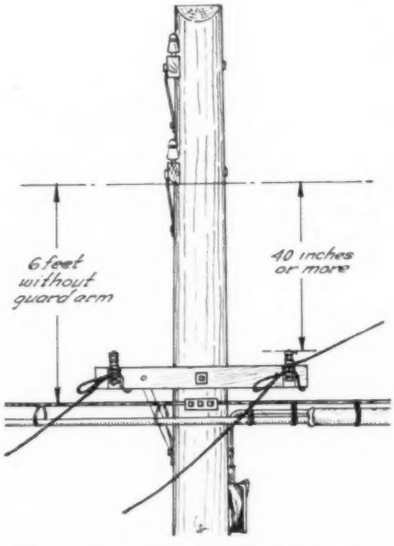

Fig. 1—Use of guard arm on joint poles.

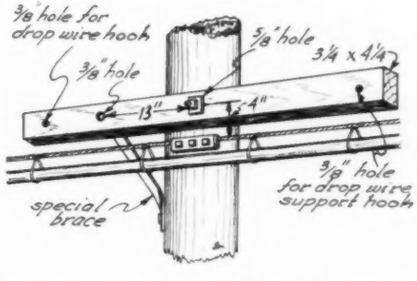

Fig. 3—Guard arm dimensions.

Drop Wiring into Terminals

THE appearance of the drop wire feeding into the cable terminal can be greatly enhanced by the use of 5/8" or

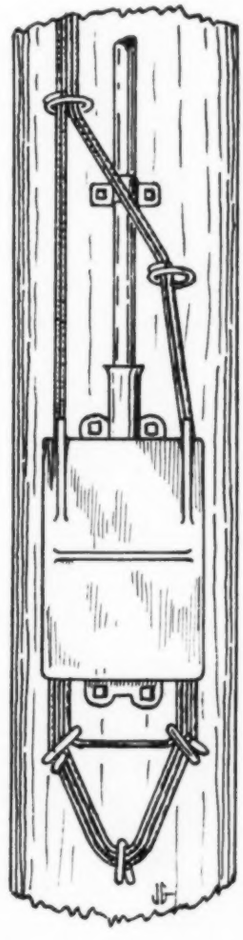

Fig. 2—Drop Wiring at Terminals.

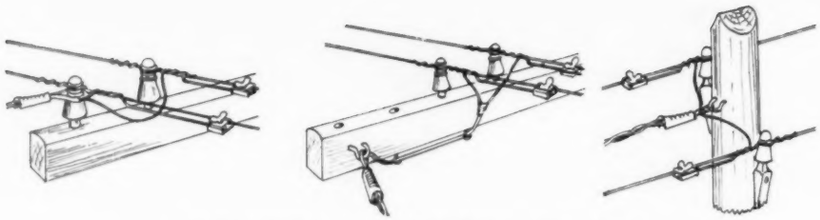

Fig. 5—Typical drop wire feeds from open wire leads.

1¼" bridle rings. The rings should be arranged as shown in Figure 2. It will be observed from the figure that slack may be obtained by removing the drop from the bottom ring in case it is needed in changing a drop from a lower to a higher lug in the terminal. Rings of the "Drive-in" type will be found very easy to install and relatively inexpensive.

Feed from Non-Joint Poles

DROPS feeding from non-joint poles should be carried up to a point several inches above the messenger before attaching to the drop support. Either pole or house brackets with insulators or pole hooks with drop wire clamps should be used as the supports.

Pole brackets should be attached to poles by means of ⅜" x 4" drive screws.

Figure 4 illustrates a typical feed from a non-joint cable lead.

Drop wire supports should be so placed that the drop does not bear against the pole and preferably so that the bracket is in line with the pull.

When drops run along a pole line paralleling a cable, it is preferable to place the drop below the cable. If this is impracticable it should be placed at a sufficient height above the cable so that it will not sag or whip into the cable.

Miscellaneous Feeds

THE method of supporting drop wires feeding from open wire leads will depend on various conditions but in general the drop support should be attached below the crossarm carrying the open wire.

Several different types of drop feeds from open wire leads are shown by Figure 5.

It is important that a good electrical connection be made between the drop and the open wire. This requires the use of either connectors or offset split sleeve of the compression type. A hand-made connection is very likely to cause trouble due to its tendency to increase in resistance over a period of years and should be avoided.

Protection for Long Drops

WHERE drops in excess of 1000 feet in length enter an unprotected cable terminal and where the drop is in an area in which lightning damage is frequent, it will usually be advisable to install an open space cutout protector on the pole near the terminal to prevent damage to the cable insulation.

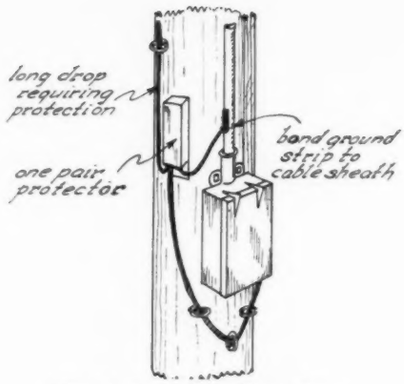

Fig. 6—Protection of long drops.

If only a single pair is to be protected, then an ordinary outside type substation protector should be used. If several pairs are to be protected then a five pair pole type protector is recommended.

The ground strip of the protector should be connected to either the messenger or cable sheath. A connection to ground can also be made if desired. However, a separate ground connection is not necessary as the maximum protection results from merely connecting the ground strip to the cable sheath as this brings about an equalization of the potentials which may exist between the cable conductors and sheath in the event of a high induced voltage on the conductor, hence, prevents insulation breakdown.

Figure 6 shows a typical installation of this type.

Building Drop Wire Installations

IN the smaller towns most of the drop wires radiate from a terminal pole to a drop wire support on the building and usually located close to a point of entrance.

Fig. 7 — Ring wiring on commercial buildings.

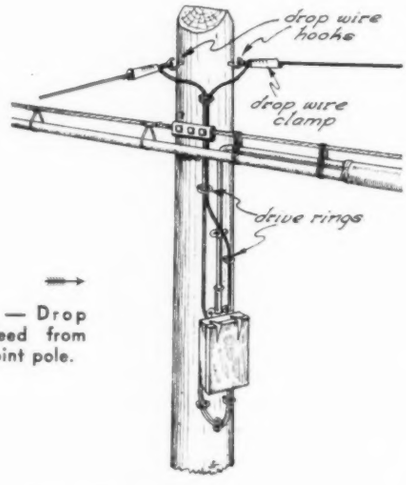

Fig. 4 — Drop wire feed from non-joint pole.

Fig. 8—Typical rings and cable clamps.

In the larger towns and cities where there is often a number of telephones in a single building, as for example an apartment house or commercial buildings, it is customary to extend a small branch cable from the main cable run to some fairly central location on the building and then feed from this terminal to the various points of entrance in ring wiring. An installation of this type presents a much better appearance than separate drops feeding direct from the pole and is much more convenient from the standpoint of the repairmen.

Where there are five or more drops entering a building, consideration should be given to the use of ring wiring fed from a terminal installed on the building. This type of construction should not be confused with building cable which refers to the use of cables installed within a large building having numerous telephones and with convenient terminals so that telephones can be connected by short runs of inside wire.

Ring wiring on the outside of buildings may make use of either ordinary No. 17 or No. 18 drop wire, or No. 20 copper bridle wire. Regular bridle wire is preferable as it occupies less space than drop wire, however its use would only be justified where there was a considerable amount of ring wiring in an exchange.

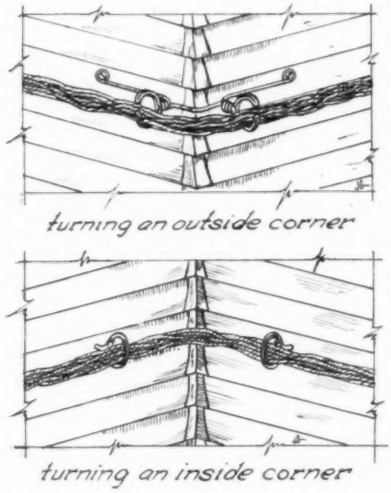

Fig. 9—Ring fixture for carrying drops around building corner.

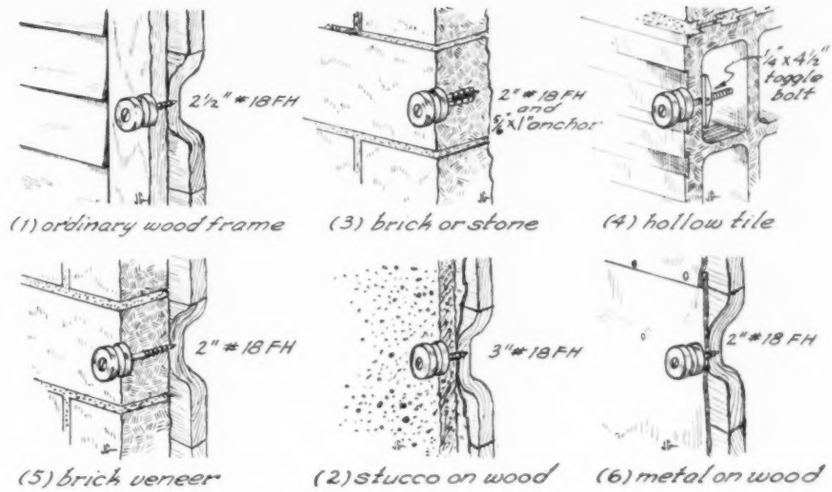

Fig. 10—Fixture installation methods on various types of buildings.

A typical installation of ring wiring on the outside of a commercial building is shown in Figure 7.

In an installation of this type care must be taken to attach the cable support strap in such manner that it cannot pull loose and damage the building. Excessive tension should be avoided in the messenger run between the pole line and building.

From the installation it will be noted that where bridle wire parallels the cable a combination cable clamp and bridle ring should be used.

The size and type bridle ring to use will depend on the type of building and the maximum number of drops to be carried. For four drops or less a ⅝ inch ring is satisfactory and above four drops use a 1¼ inch ring. The several types of rings and clamps used are shown in Figure 8.

Where bridle wires must go around the corner of a building use a corner fixture installed as shown in Figure 9.

All ring wiring and cable installed on the outside of a building should always be run on either a vertical or horizontal line and never at an angle across the building.

Attachment of Fixtures to Buildings

THE telephone construction man should be familiar with the different types of building construction and should be equipped with the proper materials and tools so that a neat and secure installation can be made regardless of the kind of building.

There are six basic types of building construction likely to be encountered, viz:

1—Ordinary wood frame
2—Stucco on wood
3—Brick or stone

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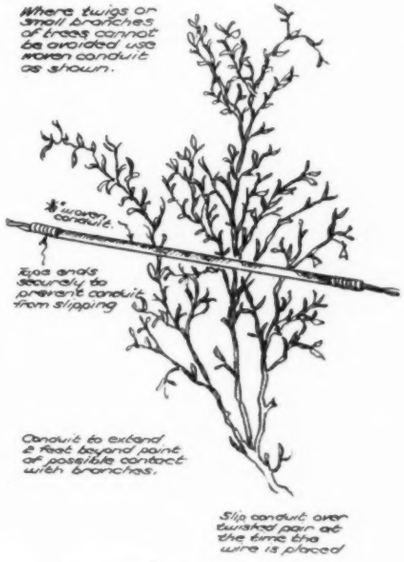
Where twigs or small branches of trees cannot be avoided use more conduit as shown.
Conduit ends secure to prevent conduit from slipping
Conduit to extend 2 feet beyond point of possible contact with branches.
Slip conduit over twisted pair at the time the wire is placed

Fig. 11—Loom Protection.

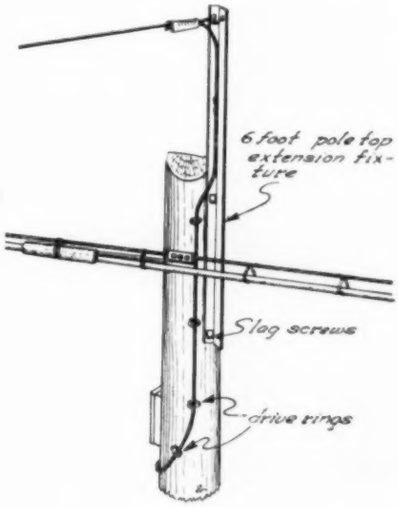

Fig. 12—Pole top extension fixture.

Usually the forgotten men, the peddlers, have their day at the Minnesota Convention. (Left) A. C. Kelley, Burgess Battery's Acousti-booth man. (Center) Cook Electric's Al Wilkins, Kellogg Switchboard's Bob Miles, and the smiling gent is Automatic Electric's G. B. Foscue. (Right) Ralph Barger, Stromberg-Carlson's telephone sales manager.

G. M. Dwelle, of Lake City, Minn. was re-elected President of the Minnesota Telephone Association.

Minnesota Association Meets in Minneapolis Convention

MOST of the representative telephone companies, large and small, met in Minneapolis, Minn., last fortnight for a three-day convention of the Minnesota Telephone Association. A well diversified program was presented with increased rates and war-time demands being featured. All officers were re-elected for another year. They were: president, G. M. Dwelle, Lake City; vice president, H. F. Lueders, Norwood, and secretary-treasurer, J. C. Crowley Jr.

A number of important speakers were heard including Messrs. Pitcher and Deering, executives of the USITA, Lt. Col. Wm. C. Henry of the Signal Corps, Chen Yih, professor at University of Minnesota and others of equal repute. Secretary Crowley is a firm believer in the importance of the smaller companies and it was noted that many of the speakers devoted most of their remarks to those company men in that category. Mr. Crowley has been instrumental in assisting many Minnesota companies in presenting their rate cases and knows the main problems of those companies in that area. Competent speakers outlined the necessity of rate increases caused by the times and the importance of keeping plants at utmost efficiency during war-time.

Directors elected for 3-year terms were: Charles Cashel, Worthington; Warren B. Clay, Hutchinson; P. A. Glaeser, Waconia; H. P. Sentman, Fairmont and Irving Todd, Hastings. Other directors are: Mr. Dwelle; Mr. Lueders; Fred Pfaender, New Ulm; W. A. Eckles, Blue Earth; Leland Wright, Alexandria; P. M. Ferguson, Mankato; S. A. Rask, Blooming Prairie; J. P. Keane, Pine Island; Vies Martinsen, Sebeka, and F. C. Marvin, Zumbrota.

During his address on opening day Mr. Dwelle sounded the keynote of the meeting in advising those assembled to see that properties were put in A-1 shape and to make studies with the thought of future rate increases or adjustments. He also patted the telephone trade journals on the back in suggesting that all telephone men read and support them to the fullest.

"Unemployment Compensation Taxes" was the subject of Prof. Emerson Smith of the University of Minnesota followed by a discussion of "China and the War" by Mr. Yih. Presentation of the Cook Electric Company movie "Danger, Live Wires", ended the first day's sessions.

Gideon Seymour, editorial director of one of the Minneapolis newspapers, was the feature speaker on the second day. He was followed by representatives of the Internal Revenue Department who discussed "Federal Tax Law as it Applies to Telephone Companies."

Louis Pitcher, executive vice president of the USITA, represented that association and presented an address on National Affairs. This talk caused much discussion as it was much in the form of a report which covered most every problem facing the industry. Mr. Pitcher especially urged that all telephone people prepare to place into effect rules on rationing of service should that order be issued by some governmental body in the future.

Greater support of the telephone journals was also urged by Mr. Pitcher who pointed out their value to both the operating companies and the manufacturers. He especially urged that sufficient copies be ordered to cover all key men in operating companies and that

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Secretary Crowley's secretary, Miss Effie Jordett, and Assistant Mrs. W. E. Motzko pose with Bugler Donnelly at registration desk.

Ross (Spike) Hollowel, Blooming Prairie, enjoys a rest—or business—with National Telephone Supply's Glen Voyles.

QUANTITATIVE DESIGN OF CENTRAL OFFICE EQUIPMENT FOR SMALLER TELEPHONE OFFICES

(Continued)

By JAY G. MITCHELL

Equipment Characteristics

THE quantitative design of the Central Office Equipment is largely influenced if not dictated, of course, by the type selected. This does not mean that a hard and fast decision as to the type can be made or should be attempted until all the factors have been thoroughly considered. The evaluation of many of the controlling elements, however, is dependent upon such things as the amount of space available, the traffic load that is to be handled, the cost of the equipment, the types of equipment with which the new is to be connected for operation, the grade of service being furnished (when there are other offices already serving portions of the exchange area), the type and number of Private Branch Exchange installations to be connected into the new office, the number of substation equipments in stock and, in the author's opinion, the effective rate schedule presently in force together with many other conditions. In the preliminary stages of the design of the Central Office Equipment no final decision can, of course, be made. It may be found necessary to completely work out the new office for Common Battery Manual, Common Battery High Efficiency Manual, Dial or, in the case of very small offices, all of these and in addition Magneto Manual. It is the considered opinion of the author, however, that few if any cases will be found in which large capacity Magneto offices, involving multiple switchboards, are found to be the most desirable type. This is because of the informal standard of service prescribed for offices of this size by an informed public opinion. Such an informal standard of service may not be readily reducible to an exact formula

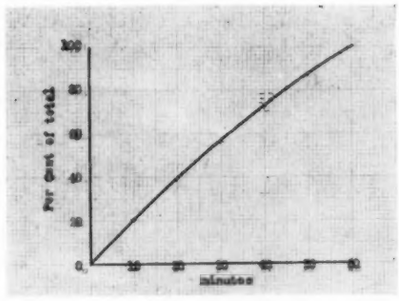


Fig. 1—Per cent of Busy Hour Traffic occurring in periods of various lengths in minutes.

but its existence **must be recognized** by all telephone companies. The type of equipment which appears to make concession to the informal standard of telephone service in small offices in the public mind under present conditions, when it is necessary to make an initial installation of Magneto equipment for any reason, is the type which can be converted to Common Battery Manual operation line by line. The important point for consideration, from the standpoint of the engineer desiring to complete a comprehensive study of the new office, is that several plans must be considered. If it is possible to start out with a definite decision as to the type of equipment to be installed, however, the consideration of other types as to their effect upon the Quantitative Design of the new office may or may not be advisable. This is said because it is the intention of the author to emphasize the undoubted fact that decisions as to the type of equipment, made from the engineering standpoint, often are found to supersede similar prior decisions made haphazardly and without thorough and complete analysis of **all the factors.** At any rate the designing engineer, fortified by complete analyses of all the conditions, is in position to make definite and easily supported recommendation to his superiors when all have been thoroughly analyzed.

Jay G. Mitchell

The Limiting Factor

IN any type of Central Office Equipment the number of connecting circuits or trunks that must be provided is very definitely fixed by the traffic load to be carried. The term means, reduced to plain non-technical language, the number of completed calls that will be made each day, the number that will be made for the "Busiest Hour" and the number that must be anticipated to be in simultaneous existence for a period of time that corresponds to the "Average Holding Time". Now telephone traffic does not present demands for service uniformly in any given telephone unit. On the contrary it always follows a very irregular program and prescribes that adequate connecting equipments must be provided for handling simultaneously existing calls very much in excess, without ex-

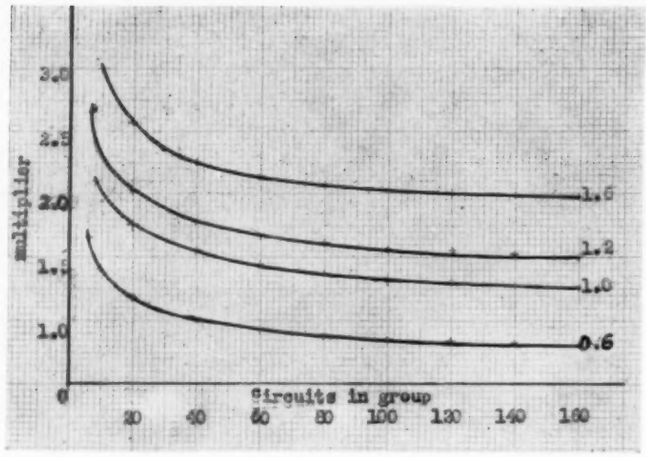


Fig. 2—Multiplying factor for groups of various numbers of circuits per group.

ception, of the average number of calls for the same period based on the proportional part of the total.

This simply means that in an office handling 1000 calls during the Busiest Hour, for illustration, that there will be required for some one period of two and one-half minutes (assumed to be the average holding time for this illustration during which a connecting circuit is held for one connection) connecting circuits sufficient to maintain about 5.2% of the "Busy Hour" load of 1000 calls or 52 calls although two and one-half minutes is only 4.16% of the whole hour of sixty minutes. In 4.16% of the time in the busy hour there will be in simultaneous existence 5.2% of the total number of calls for the entire hour. This relation between the total "Busy Hour" load in calls and the number simultaneously in existence during time periods of any length from zero minutes to sixty minutes each is shown graphically in the curve Fig. 1. Since it has been assumed, for the purpose of illustration, that the average holding time for the connecting circuit is two and one half minutes and since there will be 52 calls in progress during a period of time of that length it is clear that at least 52 connecting circuits must be provided. Now connecting circuits in the case of Manual Equipment mean cord circuits and in the case of dial equipment mean trunk circuits. The importance of recognizing that the incidence of the traffic per unit of time is not the same as the proportional part of the hour represented by the period can readily be seen from this illustration.

Multiplying Factor Due to Grouping

THERE is another factor that must be taken into consideration, however, and that is the factor which intervenes to cause an increase in the estimated number of connecting circuits because of their physical assembly into groups which are so arranged mechanically that a connecting circuit in one group may not be utilized, for mechanical and electrical reasons, to handle a call normally appearing in a relation which restricts it to the connecting circuits in another group. As the number of circuits in these groups increase, the multiplier which it is necessary to apply to the overall traffic average, in order to determine the number of connecting circuits to be provided is decreased. This means that connecting circuits serving in large groups may be safely assigned a large number of Busy Hour calls than would be the case if the groups were smaller. The relation between the overall average load in calls per Busy Hour per circuit and the number of circuits in the group is shown in the set of curves in Fig. 2.

In Fig. 2 there are four curves shown each one corresponding to a different number of calls per line for the office for the Busy Hour. These four average rates for each of which a curve is shown are 0.6 calls per line per Busy Hour; 1.0 calls per line per Busy Hour; 1.2 calls per line per Busy Hour and 1.6 calls per line per Busy Hour. These four average office Busy Hour calling rates per line represent traffic conditions obtaining in almost any ordinary telephone office which is free from special traffic conditions. The effect of line or circuit grouping, as may be developed from the curves in Fig. 2, increases the apparent number of Busy Hour calls for which connecting facilities **must be provided** in order to maintain standard service. For illustration, assume that the average busy hour load for the office is 1000 calls and that there are 1000 lines connected into the office. That would produce an average busy hour calling rate of 1.0 calls per line and the multiplying factor necessary for groups of from ten to 150 lines per group is shown by curve "C". For instance if the lines in the new exchange are in groups of ten lines per group and the average Busy Hour calling rate per line for the entire office is one call per line per Busy Hour then it will be necessary, according to curve "C", to provide **connecting circuits** for each group sufficient to handle 2.05 calls per line per busy hour. This is solely because the lines are mechanically assembled into groups of ten lines per group. If it be assumed that the lines occur in groups of forty lines per group, however, then the number of connecting circuits that must be provided to handle the same busy hour traffic is seen from the curve "C" to be only 1.55 times the average for the entire office, or 1.55 calls. For the same Busy Hour average traffic, therefore, of 1.0 calls per line per Busy Hour for the entire office the grouping of line circuits into groups of forty rather than into groups of ten decreases the number of apparent simultaneous calls that must be anticipated in the quantitative design of the connecting circuits from 2.05 calls per line to 1.55 calls per line.

Determining the Number of Connecting Circuits Required

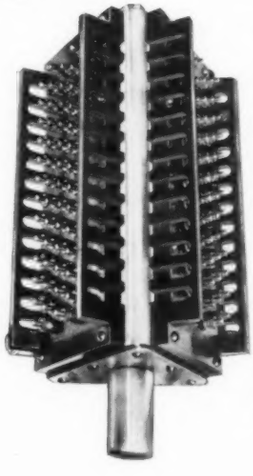
THE slightest consideration will make it plain that the number of connecting circuits such, for instance, as the cord circuits of manual equipment that are required for any given traffic, is entirely dependent upon the total number of calls and the average holding time. In other words when the connecting circuits are held for a longer time on the average call a greater number will be required than would be required if they were held for a shorter time. It is also true, of course, that, other things being equal, a greater number of connecting circuits will be needed than would be needed if the total number of calls to be handled were less. Because of these two basic facts any formula for determining the number of connecting circuits required

New Use for Phone

If the socks of one Manorville, N. Y., man aren't being darned as well as they used to be, the New York Telephone company is to blame. Assigned to investigate a complaint about recurring static a repairman on one of the company's party lines discovered that a housewife in one of the homes served by the line had acquired the habit of removing the receiver from the hook and using it as a darning egg in mending socks.

flexibility

Uniflex CABLE TERMINAL



Built up of standard units to produce completely flexible unprotected cable terminals for pole mounting in wood or metal pole houses or for pedestal mounting in underground or parkway cable distribution systems. Units can be quickly added together to furnish cable termination of almost any size, arrangement and dimension. Triangular design of heavy galvanized steel cable chamber makes for adequate interior space for cable forming and connecting. Bakelite face plates, fitted with non-corrosive studs, are clamped and gasket sealed on one or more sides of chamber when required for 52 pairs in pole, wall or cabinet mounting. Can take three plates of 78 pairs for pedestal mounting. Face plates have one piece moulded fanning strips with white numbering strips for identification markings. Bottom plate accommodates two or more self-soldering nozzles. Each unit only 12½" high. Scores of other new features. Write for complete details.

TO GIVE you the utmost in flexibility in terminating, distributing, looping and cross connecting telephone cables, Cook engineers have scored another triumph by the development of the Uniflex Cable Terminal.

Uniflex is adaptable to a wider variety of uses and occupies approximately one-half the space required for ordinary terminals, binding post chambers or pot heads.

Uniflex Cable Terminals are sold by all telephone manufacturers and supply houses.

COOK ELECTRIC COMPANY

2700 SOUTHPORT AVENUE • CHICAGO

for a definite volume of traffic and a certain definite holding time on the average call, and this number is the same number as that indicating the number of calls simultaneously in existence during the period of the average holding time, must we weighted for the total number of calls and for the average holding time. Determinations made by the use of such a formula are, of course, subject to the use of the multiplier to compensate for the apparent greater traffic, for any average calling rate, due to the grouping of the circuits into groups. In Fig. 2 there are shown four curves, each for one common overall office calling rate, and their relation to the multiplying effect of various sizes of line groups.

Many formulae have been offered for this purpose but the empirical formula shown below has been found by the author to result, when carefully used, in results that are dependable, safe and conservative. The formula is:

Number of Trunks=

$$TC + 2.7\sqrt{TC(1-T)}$$

In this formula,

T=Average Holding Time in **Fraction of an Hour**

C=Total number of calls to be handled

In using this formula the result obtained is the number of connecting circuits that will be required assuming that all circuits are in one large group. If the average calling rate per line for the Busy Hour in the entire office is 1.2 calls then the number of connecting circuits will be multiplied by a factor of 2.35 (see Fig. 2) in order to determine how many calls will be likely to be offered from each group of ten lines. If the circuits from which the traffic originates are grouped into groups of forty lines per group, on the other hand, then the multiplier that must be used (see Fig. 2) is 1.775 instead of 2.35.

Minnesota Convention

(Continued from page 22)

manufacturers continue to advertise for the purposes of keeping their names and wares before the public and to aid the trade publications to continue serving their important functions to the industry.

C. W. Stein of the St. Paul FBI office told the association about "Combatting Espionage Agents and Saboteurs" in opening the afternoon session. He was followed by N. J. Holmberg of the Minnesota commission who spoke on Rural Telephne Service. Mark T. Caster, former plant superintendent of the Lincoln (Nebr.) Tel. & Tel. Co., spoke on accident prevention under the title of "Any Accident Aids the Axis."

The convention was then introduced to Lt. Col. Wm. C. Henry, Signal Corps, and a vice president of the USITA who spoke on the subject "Telephone Industry's Part in National Defense." Col. Henry outlined the three specific services the Army depended on from the telephone industry which are: (1) Furnishing equipment and supplies; (2) furnishing trained personnel for the Signal Corps and (3) providing efficient commercial facilities and service for both civilian and military needs. He also presented a film titled "Safeguarding Military Information" which proved very instructive.

The final day was used extensively for open discussion and those in attendance heard wage-hour discussions on both the Minnesota and Federal Wage-Hour Law. Mr. Crowley lead much of the discussion and did a very good job of interpreting the main features for his

J. C. Crowley, Jr., Minneapolis, was re-elected secretary-treasurer of the Minnesota Association.

members. Mr. Crowley has been very active in getting smaller and larger companies to co-operate in many ways and is especially anxious that the smaller companies be aided in every way possible to give better service.

Automatic Telephone Dialer, Inc.

WASHINGTON—The S.E.C. has suspended the effectiveness of a registration for $225,000 of common stock of Automatic Telephone Dialer, Inc., on grounds that the statement contained untrue statements and omitted to state material facts.

Station Gain for January Below 1941 Corresponding Month

The station gain for the Bell System in January fell below the total for the corresponding month in the previous year for the first time in more than three years, it was announced Feb. 3. Although the System added 109,500 telephones in service in the month, the rate of upswing was believed to have been retarded by the closing of many sales agencies, particularly automobile dealers, the discontinuance of sales forces by manufacturers devoting their plants mainly to defense production, and the closing of homes by couples when the husbands enter the armed services.

Despite the drop in comparative figures, however, the American Telephone and Telegraph Co. has more stations in service than ever before, a total of 18,950,700 at the close of January. It is felt that the slackening of the station rise is actually a good thing, since it necessitates the manufacture of fewer instruments, with a resultant saving of materials and permits Western Electric plant capacity to be devoted to a greater extent to the production of Army and Navy communications apparatus.

The rise of 109,500 telephones compares with a gain of 129,200 for the corresponding month of 1941, although it is an increase over the figure of 94,700 for January, 1940. The drop in comparative totals marked the first time in 39 months, or since October, 1939, that this has occurred.

Arkansas Commission Denies Rate Increase Request

The Southwestern Bell Telephone Co. was again denied its application to increase exchange rates in 25 cities and towns in Arkansas by the state utilities commission last week.

The rate increase application was proposed in the Southwestern Bell's response to a commission order asking it to show cause why the level of charges of the intrastate toll service was higher than rates of the American Telephone and Telegraph long distance interstate service. The commission asserted that the intrastate toll rates should be reduced $132,000 a year to remove this differential.

In seeking an increase in exchange rates the Southwestern Bell stressed to the commission that its present rate schedules in Arkansas did not produce revenue sufficient to pay the cost of furnishing service, particularly in view of the increasing taxes and wages.

"SHE SAYS O. K.!" For clinching a date or clinching an order, this subscriber concedes that the telephone is "a mighty handy little gadget to have around." • No matter how lightly it is referred to, the telephone, nevertheless, is recognized as mighty important in the conduct of everyday affairs. To make sure that this essential, though commonplace, means of communication is efficiently maintained, use

GENERAL CABLE

Paper Telephone Cables

DISTRIBUTED BY

AMERICAN
AUTOMATIC ELECTRIC
SALES COMPANY

1033 WEST VAN BUREN STREET • CHICAGO, ILLINOIS

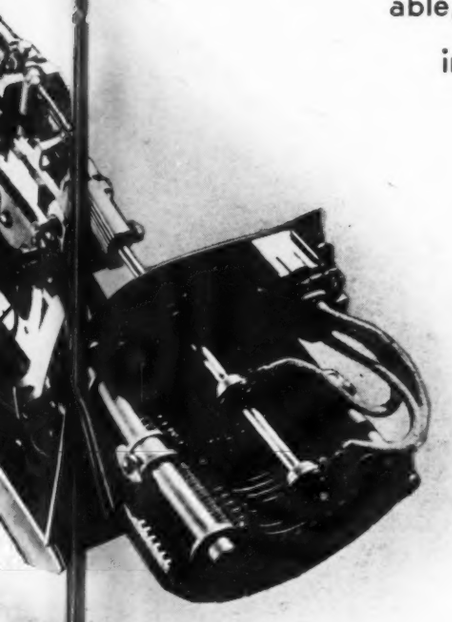
BRANCH WAREHOUSES AT DALLAS, KANSAS CITY, LOS ANGELES, RICHMOND (VA.) AND SAN FRANCISCO

It doesn't wear a uniform—

yet the Strowger Switch is in the first line of defense...

Telephone traffic is the lifeblood of the national defense effort. From mine to mill, from factory to warehouse, from supply depot to cantonment, messages shuttle with the speed of light, bringing from one end of the nation to the other coordination of effort and unity of action on a scale never before equalled.

In the midst of this increasing telephone activity is the Strowger switch. Through its tireless performance, its speed and accuracy of response, and its dependable, trouble-free operation, it is helping telephone companies everywhere in their daily contributions to the national effort—just as in more direct ways it is serving defense plants and the armed forces of the nation on land and sea, and in the air.



Playing a less spectacular role than machine gun or tank, the Strowger switch is nevertheless contributing mightily in minutes and seconds saved, in man-power and work hours conserved, and in operating and maintenance economy for every telephone organization for which it labors.

The Strowger switch will never wear a uniform, but it is none-the-less playing a vital part in the ranks of men and machines now working together toward the common goal.

AUTOMATIC ELECTRIC

ORIGINATORS AND DEVELOPERS OF STROWGER STEP-BY-STEP MACHINE SWITCHING AUTOMATIC DIAL SYSTEMS

MAKERS OF TELEPHONE, SIGNALING AND COMMUNICATION APPARATUS
ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS

Distributors in U. S. and Possessions:
AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 W. Van Buren St., Chicago, U. S. A.
Export Distributors: AUTOMATIC ELECTRIC SALES COMPANY, LIMITED

Personals from the Field

J. H. Raile is the new owner of the Partridge (Kan.) Telephone Co. **P. D. Garber,** the owner and operator since 1927, has moved to Louisiana. His brother, R. O. Garber, will operate the exchange for the new owner.

•

Fred Yates, for 37 years a maintenance man at Ottawa, Kan., retired Dec. 31 and was honored by a banquet during January. In 1905 he served as acting wire chief of the old Ottawa Telephone Co., then with the Kansas Telephone Company, and from 1926 with the Southwestern Bell.

•

Henry B. McClure, 51, an employee of the Southwest Telephone Company at Allen, Okla., was killed in an automobile accident during mid-January.

•

C. W. Brooner filed application in late January for permission to sell the Purcell (Mo.) Telephone Exchange.

•

A. Frank Bear, 45, traffic supervisor for the Mississippi division of the Southern Bell, died Jan. 8, at Jackson, Miss., following a short illness. He was a war veteran and won the D.S.O.

•

Farris E. Young has been appointed manager of the Citizens Telephone Company of Brazil, Ind., to fill the vacancy caused by the recent death of **Virgil Buntin.** He had been manager of the New Castle system for the past year.

•

Dr. Isaiah Bowman, president of the Johns Hopkins University, has been elected a director of the American Tel. & Tel. Co., to succeed Barklie Henry, who has been called to active duty by the Navy.

•

Edward M. Hicok, for the last three years comptroller of manufacture for the Western Electric Company, has been appointed to the new Company post of personnel relations manager for the Manufacturing Department, effective February 1, 1942. Succeeding **Mr. Hicok** as comptroller of manufacture is **John M. Stahr,** who has been Works comptroller of the company's Hawthorne plant since 1936.

•

Frank Miles, 73, operator of the switchboard at Ames, Okla., was found shot and hanging recently according to a report sent in by **H. H. Harris** of the Drummond (Okla.) Telephone Company. The verdict was suicide.

•

J. N. Johnson, general manager of the the Ashland (Ky.) Telephone Company, gave a turkey to each of his company's 240 employees in 17 different offices last Christmas.

•

Leland Wright

Leland Wright has been re-elected general manager of the Alexandria (Minn.) Telephone Company. He is recuperating from an extended illness. **C. L. Cole** is president.

•

C. F. Moebius, 52, supervisor of underground work for the Wisconsin Telephone Company for the past 22 years, died at his home in Milwaukee, Wis. on January 23.

•

M. J. Steeg of Springfield is the new wire chief at the Ottawa exchange of the Illinois Bell, succeeding **W. L. Sutherland** who becomes wire chief of the Alton, Ill., exchange.

•

Congratulations to **Mr. and Mrs. William E. Bell,** Lincoln, Nebr., on the golden wedding anniversary. He retired in 1935 as general commercial superintendent of the Lincoln company.

•

C. R. Baldwin, formerly manager of the Humboldt, Nebr., exchange of the Lincoln Tel. & Tel. Co., moved to California a year ago. He is the new manager of the Lancaster, Calif., exchange of the Associated Telephone Co., Ltd., according to newspaper dispatches.

•

Lieut. Commander Warren A. Shaw, U. S. N., tossed a finger ring made from a German incendiary bomb into one of the open hearth furnaces of **John A. Roebling's Sons Co.** New Jersey plant during the presentation ceremonies of the Navy "E" pennant to that company. The melt which received the ring will be used in the manufacture of aircraft control cords and returned to Germany post haste—for obvious reasons!

•

J. C. Crowley, Jr., secretary of the Minnesota association received many congratulations on their convention held last month and reported in this issue. He was re-elected secretary-treasurer.

•

C. A. Cartwright, manager of the Carroll Telephone Co., Delphi, Ind., is recuperating at his home following an illness at an Indianapolis hospital.

•

Virgil Buntin, 63, general manager of the Citizens Telephone Co. of Clay County, Brazil, Ind., died January 4. He was also president of the west central district of the Indiana Telephone Association. His successor at Brazil has been named.

•

Oscar Burton, Tyler, Texas, and **George Butler,** Austin, president and secretary respectively of the Texas Telephone Association, have written us personal invites to attend their association, convention during March. We hope to meet in Dallas with our old Texas friends and are looking forward to the visit.

•

R. A. Lumpkin, president of the Illinois Commercial Telephone Co., and recently selected as an advisor on the staff of **Bruce H. McCurdy** in the Communications Branch, telephone section, of WPB, has a hobby that is not only fun but profitable, that of raising and judging fine saddle horses.

•

According to a letter from **R. B. "Doc" Fairly,** president of the Southwestern Associated Telephone Co., Lubbock, Tex., we hear that **John Howard** of that company is back on the job after recuperating from an illness suffered last November. **Doc,** as usual, did a little boasting on Texas weather.

•

C. E. Cooper has applied to the Missouri commission for permission to sell the Mokane, Mo., exchange to **Russell Laube.**

Harold E. Gray

Harold E. Gray Passes

Harold E. Gray, 58, plant superintendent of the Durham (N. Car.) Telephone Company, passed away at his home the night of January 9 following a heart attack. His death came as a shock to his many friends and business associates as he was stricken that day.

Mr. Gray was born in Leavenworth, Kansas, and lived in Kansas City the greater part of his life. He moved to Durham six years ago and served as plant superintendent for the Durham company during that time.

In reporting the death to TELEPHONE ENGINEER, Mr. H. B. Fine, commercial supervisor of the Durham company, paid Mr. Gray a wonderful tribute on his service to his company and country. Survivors are: Mrs. Gray, his widow; a daughter, Mrs. Whit Johnson, Moultrie, Ga. two brothers and one grandson.

Oil Causes Enlargement

The facilities of the Carmi exchange of the Illinois Commercial Telephone Co. will be increased by the installation of a 4 position toll board. At the present time, there are 8 operators' positions, 5 of which are used for toll and 3 for local calls. When the new board is installed, there will be 8 toll positions and 4 local positions. This added equipment is required because of the oil activities in the vicinity of Carmi.

I. T. & T. Station Report

Telephone operating subsidiaries of the International Telephone and Telegraph Corporation in Latin America report an aggregate net gain of 36,950 telephones in service during 1941 and the telephone company of Spain which is also an I. T. & T. company gained 17,705 telephones last year.

TOOLED-UP

to Maintain America's Lines

America's lines of telephone communication now carry a greater responsibility than ever before. And, today's lineman must stand equipped to do the finest, fastest work. A great deal of his efficiency depends upon the quality and design of the tools he uses. That's why leading independent telephone companies choose GRAYBAR as the logical source of tools. They know that the tools they buy from GRAYBAR are not only designed for the job, but that their performance has been pre-tested under actual field conditions by leading companies who buy via GRAYBAR.

So, next time you need anything along the line, remember to call on your local GRAYBAR Representative. You'll be sure to get quality products and cooperative service no matter how large or small the item.

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in over 80 principal cities
Executive Offices:
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Conducted by B. C. BURDEN, Technical Editor

Line AND Desk

Transmission

Q. Can good transmission be obtained on a half-phantom type of circuit?

A. Yes, excellent transmission can be obtained as far as volume efficiency is concerned, however, a half (grounded) phantom circuit has the same characteristics as a grounded line and if paralleled by a power line it will be very noisy and if it extends a considerable distance with other telephone circuits it will pick up considerable crosstalk. The physical circuit on which the half phantom rides will be quiet and free from crosstalk if it is properly transposed. From a volume standpoint the half phantom should have as good or better transmission than a grounded line inasmuch as there is two wires in parallel to carry the voice currents.

Q. We are having trouble with several subscribers lines which are located in close proximity to a broadcast station. These lines pick up the broadcast program which interferes with the normal use of the lines. How can this interference be eliminated?

A. The simplest method of eliminating interference from broadcasting stations is to connect two .005 m.f. condensers one from each side of the line to ground. These can usually be conveniently mounted and connected at the protector. These condensers offer a low impedance path for the radio frequency currents hence shunts them off to ground, but the impedance is so high to the voice frequency talking currents that they do not interfere with transmission.

Q. Is there any way to repair noisy transmitters, i.e., transmitters that tend to "sizzle" or "fry"?

A. There is no really satisfactory method whereby the operating company can repair noisy transmitters other than by complete rebuilding. It is generally advisable to send the defective transmitters into one of the telephone repair houses for rebuilding. Noise in transmitters is generally due to either pitted electrodes or bad carbon, or both. In any event both the carbon and electrodes will generally need to be replaced and the transmitter readjusted.

Q. Are any special protective precautions or equipment required for a subscribers line which terminates in a large power plant or substation?

A. Yes, either an isolating or equalizing transformer is required to prevent dangerous potentials being set up on the telephone line during periods of fault on the power line. These dangerous voltages result from the fact that most power systems operate with a Y connected transformer bank with the midpoint of the transformers grounded at the substation. When a line becomes grounded there is a high current flow into the substation ground. This fault current flowing to ground raises the potential of earth under and immediately around the substation to a substantial value. The telephone system wiring and instrument are essentially at zero ground potential inasmuch as they connect at their distant end to low voltage protective gaps, hence anyone in contact with the earth or grounded portions of the building at the substation and attempting to use the telephone might receive a severe if not fatal shock. For example a large substation may have a resistance to ground of say 1.0 ohm. Under fault conditions it would not be unusual for fault currents of as much as 1000 amperes to flow. This much current flowing to earth through the 1.0 ohm would raise the potential of the earth at the substation to 1000 volts.

By placing a 1 to 1 ratio transformer with well insulated windings in series with the telephone circuit at the substation the telephone is isolated from the central office ground. An isolating transformer cannot be used on common battery lines however hence with C.B. lines it is necessary to use what is known as an "equalizing transformer". These consist of a transformer with three windings all having the same number of turns. The telephone line is connected in series with two of the windings the magnitude of which is to the substation ground at one end while the opposite end of the third winding is connected to a remote ground, i.e., a ground located 500 to 1000 feet away from the substation. When fault current elevates the voltage of the substation ground this causes current to flow from the substation ground through the winding and to the remote ground which is of course at zero voltage. This current induces an equal voltage in both of the other windings that magnitude of which is approximately equal to but opposing the difference in potential impressed across these windings hence tends to equalize the difference in voltage at the substation and that at the central office. Fig. 1 illustrates a typical application of equalizing coils at a large power substation.

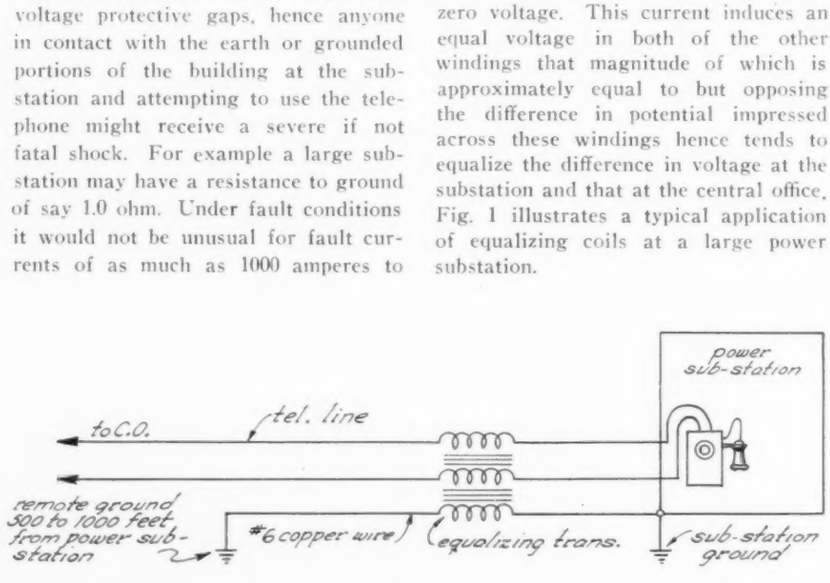


Fig. 1.

ADEQUATE OPERATING SUPPLIES ARE NECESSARY TO PREVENT ANY BREAKDOWN IN SERVICE

It's "ALL OUT" now for Defense and Victory! Efficient communication is necessary. Your company is an essential link in the chain.

In recognition of this, the OPM has directed that you keep your equipment in repair and has assigned an A-10 priority rating to enable you to do it.

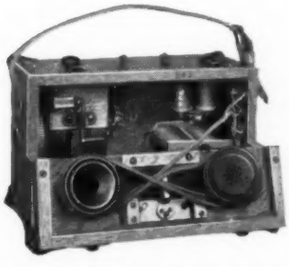
One important step is having on hand at all times a stock of operating supplies adequate to meet any emergencies.

Stromberg-Carlson is prepared to cooperate by making prompt shipments of these operating supplies. Check your stock *now* and order those you need.

STROMBERG-CARLSON TELEPHONE MANUFACTURING CO.
Factory and Gen'l Offices: 100 Carlson Rd., Rochester, N.Y., U.S.A.
Branch Offices: Chicago, Kansas City, San Francisco, Toronto

No. 1501 Stromberg-Carlson FRICTION TAPE

Made of a strong, closely woven cotton fabric which is thoroughly insulated with an adhesive insulating compound that retains its sticking qualities throughout all seasons. Black ¾" tape is put up in ½ lb. rolls; 2" width in 1-lb. rolls, 165 ft. to the lb.



No. 843 Test Set

Gives linemen, section gangs, and patrols quick communication with headquarters. Hooks to magneto lines; has 5 bar generator; 1000 ohm ringer; handset carried in lid; uses 2 No. 790 Eveready Tungsten Dry Cells (included). Shipping Weight: 20 lbs. Dimensions: Height, 7½ in.; Width, 11⅜ in.; Depth, 6⅝ in.

Klein's Haven's Steel Grips

A popular grip for general line construction work. Almost automatic in action. Handle and eccentric allow instantaneous hold. A shake of the rope on the tackle disengages the grip.

NICOPRESS Sleeves and Tools

Splices made with Nicopress sleeves and tools are tight as a weld and the conductors will not pull out. They have a lasting high conductivity. They exceed the rated breaking strength of the conductors. Nicopress splices are easily made with the light Nicopress tools.

Klein's Pliers

We carry a complete line of these tools for every work requiring pliers.

Kester Rosin Core Solder

Contains a plastic rosin flux that will not corrode. It is the accepted standard for inside wiring. Runs about 50 ft. to the lb. In sizes from ¼ inch to .040 inch in diameter. Ribbon or flat type. Furnished in 1, 5, and 20 lb. spools.

Stromberg-Carlson ★★★★

Conducted by
R. A. Clark, Jr.

Cross-talk Theory

Further discussion of the cross-talk problem is presented in this article, the fifth of a series.

IN the preceding article, the formula for converting cross-talk units to DB was presented and discussed. The curve shown in Fig. 1 is a graphic illustration of the formula and will be of help in getting a true picture of cross-talk as presented in the tables shown in the second article (October, 1941 Telephone Engineer).

It is of interest to know what values of cross-talk can be tolerated. You will note that the curve starts at 80 DB of cross-talk which is equivalent to 100 cross-talk units and extends to 20 DB which is 100,000 cross-talk units. If a person talks on a circuit with the ordinary telephone the power output is approximately plus 10 db level. The cross-talk into a circuit having 100 units or 80 DB would be barely discernible even though there was practically no noise. Seventy DB of cross-talk could be heard on a quiet circuit although it is unlikely that speech would be understandable. Sixty DB of cross-talk is barely understandable on a quiet circuit, however with the average amount of noise either in the room or on the line this amount of cross-talk is not objectionable. When the cross-talk reaches 50 DB it becomes understandable and may be quite objectionable especially on quiet circuits. In other words 1000 units of cross-talk or 60 DB is about the upper limit. If the cross-talk is doubled, ie 2000 units or increased to 54 DB it would be approaching objectionable limits.

This discussion brings out the important feature of voice power levels. The above discussion is based on the average telephone transmitter and receiver used during the past 15 years. Recent developments have improved the sensitivity of receivers and also the power output of transmitters. In addition telephone repeaters have come into extensive use whereby voice levels are often raised as much as 10 DB. Therefore the cross-talk limits may necessarily have to be reduced in some cases owing to the higher output levels on the lines and the increased sensitivity of receivers. Referring to the tables presented in the second article, you will note that the cross-talk values shown in Table 1 are in the neighborhood of the permissible limits specified above. Therefore at voice frequencies one or two miles of unbalanced circuits may be the limit which can be tolerated.

The curve of Fig. 1 in this article explains the derivation of the values shown in Table 3 of the second article. The basic theory covering coupling between two circuits tells us that the cross-talk units increase directly with the length of unbalanced circuits. For example Table 1 shows the cross-talk between wires 1—2 and 3—4 to be 60 DB. This is equivalent to approximately 1000 cross-talk units. If we double the length of circuit unbalance i. e. make it 2 miles, the cross-talk units will rise to 2000 corresponding to a cross-talk of 54 DB as seen from the curve. The difference is therefore 6 DB which must be subtracted from the 60 DB value as shown in Table 3. Likewise if we have a one-half mile unbalance the cross-talk would be ½ of 1000 units or 500 units which in the curve shows 66 DB. Therefore 6 DB is added to the 60 in order to de-

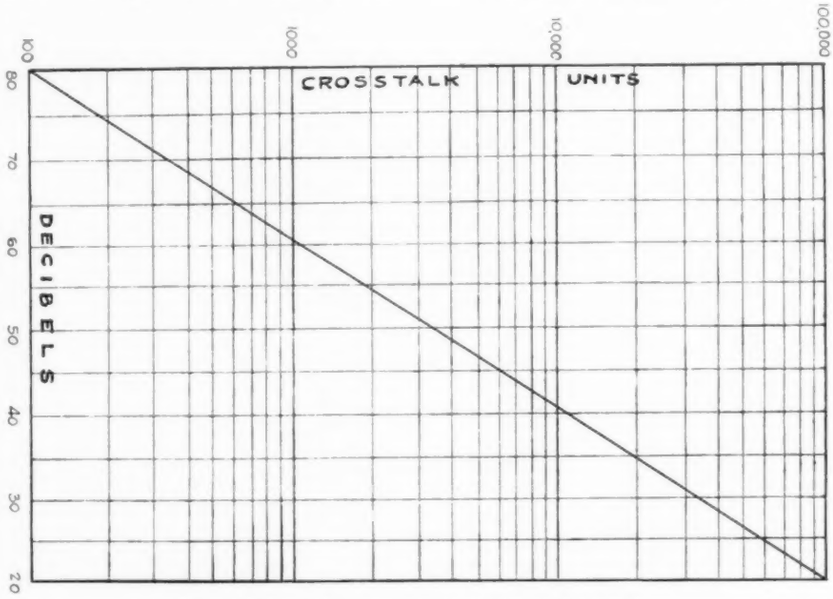
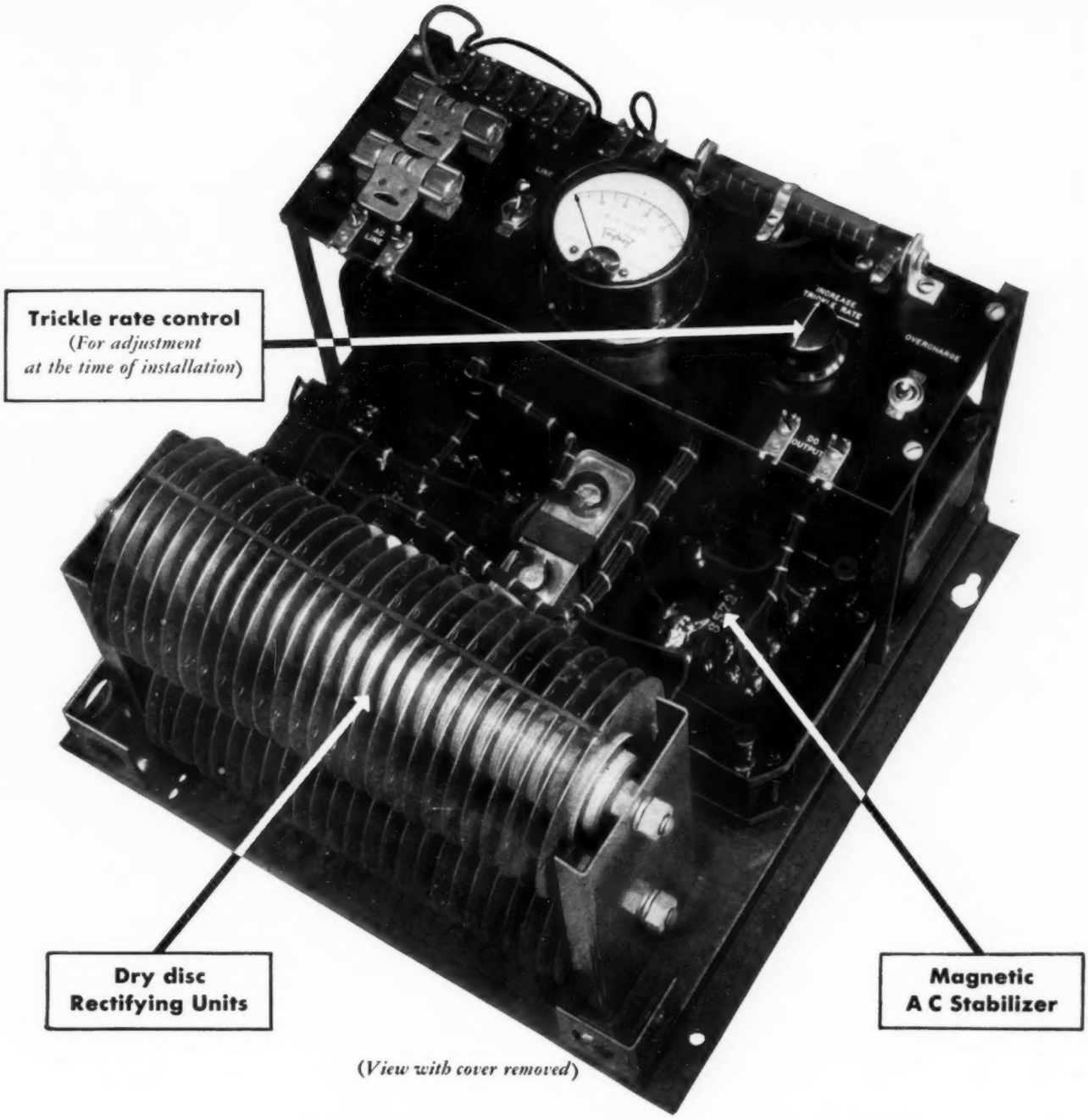


Fig. 1—Relation between cross-talk units and decibels.



(*View with cover removed*)

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PLUG 'em in — go away and forget 'em. What a pleasure it is to use a battery charger without moving or expendable parts. Nothing that requires frequent adjustment.

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*See Suttle Catalog

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Do It The Easy Way!

Send your old parts to

SUTTLE EQUIPMENT Co.

LAWRENCEVILLE ILLINOIS

termine the cross-talk for ½ mile of unbalance.

The basic theory also tells us that the cross-talk units increase directly with frequency, thus we can use the curve in Fig. 1 to determine the cross-talk at frequencies other than 1000 cycles. While this statement is not exactly true it is sufficient for making first approximations in studying the cross-talk problem. Factors such as phase-angle shift along the line make it rather difficult to exactly calculate the cross-talk at different frequencies, however I believe that in all cases the actual cross-talk will be less than that computed so that we will always be on the safe side.

Illustrating the variations of cross-talk with frequency, let us again consider the cross-talk between wires 1—2 and 3—4 which is 60 DB or 1000 units at 1000 cycles. If we double the frequency the cross-talk doubles or goes up to 2000 units which is 54 DB. Therefore to convert from 1000 cycles cross-talk to 2000 cycles cross-talk we must subtract 6 DB as shown in Table 2.

In the next article we will discuss the effect of transpositions and explain how cross-talk can be reduced between two circuits by the use of special transpositions added to the regular scheme.

(END)

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BRANCH WAREHOUSES AT DALLAS, KANSAS CITY, LOS ANGELES, RICHMOND (VA.) AND SAN FRANCISCO

25 YEARS AGO THIS MONTH

Taken from TELEPHONE ENGINEER files of February, 1917

The war in Europe during 1917, has caused a scarcity of various articles once available in large quantities and much effort and ingenuity have been used by all the warring nations to find substitutes for them. Wheat and rye flour have been much in use for thickening the electrolyte of dry batteries, but because of their scarcity, attention has now been turned to other substances. Of these kieselguhr, waterglass, gelatine, starch, sawdust and glass-wool seem to have proved satisfactory.

With 355 miles of cable stretched from Jacksonville, Florida to Miami and the last lap to Key West under construction, the long distance telephone service of the American Tel. & Tel. Co., that will constitute a joining link with the proposed cable from Cuba, will be completed in about March 1, 1917. When finished, the line will be 522 miles long. Inability to get material has caused some delay on the Key West extension, as part of the cable used is manufactured in England.

The inauguration of a movement for the consolidation of rural telephone lines of South Dakota connecting with the Garretson system whereby the Garretson company would be the parent system, thereby giving better service, has been begun by some of the stockholders of the rural lines. It is thought some definite arrangement will be made in the near future.

Experiments are being made in Washington to ascertain if it would be practicable and possible to install a telautograph system in the Senate whereby senators in their offices could be informed of the proceeding under way in the Senate chamber. The present system of call bells was felt by some of the younger senators to be out of date and not sufficiently indicative since there are only five signals now in use. The telautograph would be operated by a clerk at the reading desk of the Senate and would record actual happenings on the floor of the Senate at the time of their occurrence.

TELEPHONE ENGINEER reported the twenty-fifth anniversary of the Automatic Electric Company which had been celebrated by officials and employees of that company with a banquet and dance at the Hotel La Salle's Louis XIV room on January 27.

More aluminum up there, less in new telephones —for victory!
Many materials used in telephone making are listed as "critical" for war purposes. Bell Telephone Laboratories and Western Electric have redesigned apparatus and changed manufacturing methods to employ available materials.
Take aluminum. The reduction in its use in a year's telephone output is enough to build 294 combat planes. This program has been replacing critical materials at an annual rate of 7,747,000 pounds. Though it grows steadily more difficult to maintain as shortages increase, the program helps to meet the greatest demand in history for military and civilian communication equipment.
"THOSE PLANES WILL HELP DADDY LICK 'EM!"

Western Electric *. . . is back of your Bell Telephone service*

Item to be attached	Type of Building Construction 1	2	3	4	5	6
Metal brackets	2" No. 14RH	3½" No. 14RH	2" No. 14HR	¼"x3½" Tog	6" No. 14 RH	2" No. 14RH
Single Groove Parallel	2½" No. 18FH	3" No. 18FH	2" No. 18FH	¼"x4½" Tog	7" No. 18FH	2" No. 18FH
Double Groove Parallel Drop Wire Knobs	3" No. 18FH	3½" No. 18FH	3" No. 18FH	5/16"x5" Tog	7½" No. 18FH	2½" No. 18FH

Note No. 1—Numbers refer to classification of buildings given in a preceeding paragraph.
Note No. 2—Installation in masonry to be with 5/16"x1" screw anchor.

Wire Chief's Training Course

(Continued from page 21)

4—Hollow tile
5—Brick veneer
6—Metal on wood

The method of installing fixtures for each of the several types of building is illustrated by Figure 10.

The actual length of toggle or screw to be employed will of course depend on the fixture being placed, but in general the following table should prove helpful.

Care must be taken to avoid splitting siding or trim on frame buildings. A small "pilot hole" drilled with a steel bit will help prevent splitting.

Where possible and particularly with fixtures that carry considerable strain, the fixture should be installed over a studding to insure against possible pulling out.

Protection of Drop Wire Through Trees

WHERE a drop must pass through trees some form of protection is required. Either a light weight split wood molding which can be placed over the drop where it passes through the trees or a woven fabric conduit which has to be slipped over the drop as shown in Fig. 11 will provide fair protection.

(To be continued)

Pole Top Extension Fixture

WHERE a drop is being installed from an existing pole which is of inadequate height to give the drop proper clearance over a roadway, some economy can be effected by the use of a pole top extension fixture installed as shown in Fig. 12.

Dr. Charles L. Best

Dr. Charles L. Best, 62, chairman of the board of the Northwestern Telephone Co., Freeport, Ill., died February 6 following a heart attack.

Dr. Best was a Fellow in American College of Surgeons, a 32 Mason, an Odd Fellow, Chairman of the local Selective Service Board, director of the State Bank of Freeport, member of the Park Board and chief of staff of St. Francis Hospital, Freeport. He was educated in Freeport High School, University of Michigan, University of Chicago and a post graduate 2-year course in surgery at Vienna, Austria. He started practice in Freeport in 1907 and kept offices in the same building since. His birth date was Dec. 21, 1879.

Survivors are his widow and 2 daughters, Mrs. George Byram and Mrs. John M. Linden.

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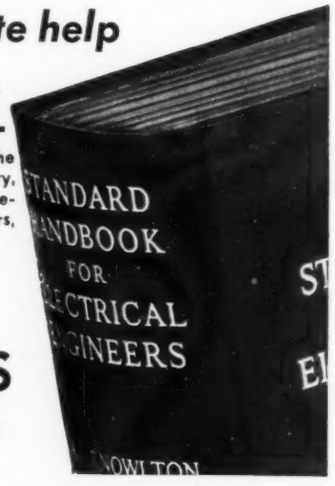

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Course Examination No. 11
DROP WIRE CONSTRUCTION—PART 2

1. What is the purpose of the GUARD ARM?
2. What clearance on a joint use pole is required between the bottom of a power crossarm and a cable messenger?
3. Should drop wire which parallels a cable be run above or below the cable?
4. Is a 3/8"x2" drive screw suitable for attaching a drop wire pole bracket to a pole?
5. If a pole type open space cutout protector is used to protect a long drop entering an unprotected cable terminal, is it necessary to connect the ground strip of the protector to earth?
6. Under what circumstance is ring wiring on buildings justified?
7. What size bridle ring should be used on a run of ten drops?
8. What size, length, and type of screw should be used when installing a house bracket on a brick veneer building?
9. What principal precaution should be taken when installing drop wire fixtures on a frame building?
10. How can drop wire be protected against abrasive action where it passes through trees?

Book Review

New Edition Standard Handbook Now Available

The seventh edition of the **Standard Handbook for Electrical Engineers** has just been released by the publisher.

The new edition has been greatly enlarged and improved and now represents the finest electrical reference book obtainable. The section dealing with telephone and telegraph work has been revised and enlarged and contains much new data on such subjects as telephone transmission, inductive interference, subscribers sets, etc. The wide range of useful electrical information in the 26 sections of the new Handbook makes it a worthwhile investment for every telephone company. The price is only $7.00 and the book can be obtained direct from McGraw-Hill Book Co. Inc., 330 West 42nd St., New York, N. Y.

Book Review

A useful and interesting handbook recently published by the Chemical Publishing Co. Inc. of 240 King Street, Brooklyn, N. Y., incorporates for the first time in one volume a complete set of wire gauge tables in addition to much other useful information. In a convenient size and an attractive binding this new book contains a complete set of tables dealing with wire of every type.

It also contains miscellaneous information on such subjects as number of turns on coils, twist drill sizes, metric conversion factors, composition of solders, and much other useful data. The price is $2.50 and it may be ordered through Telephone Engineer Magazine.

Ohio Standard Buys Darrtown

The Ohio Standard Telephone Company has purchased the assets and stock of the Darrtown (Ohio) Telephone Company, it was announced recently in Oxford by William Clemons, district manager.

After the Public Utilities Commission of Ohio approves the sale, the exchange will be moved from Darrtown to Oxford and the Darrtown subscribers will be placed on the rural service of the Oxford company.

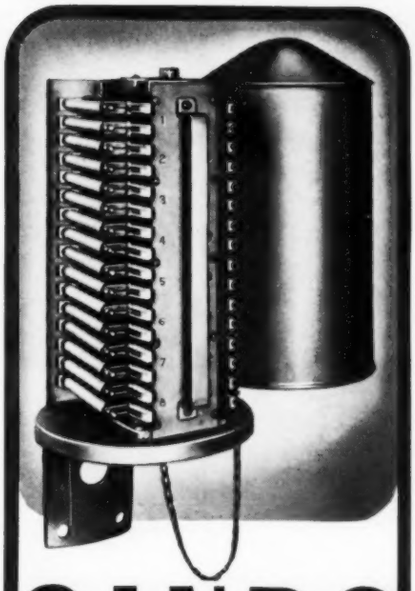
Until the Utilities Commission approves the sale, calls to Darrtown will be handled as previously.

The Oxford company purchased the Darrtown company from E. L. Miller and Son, operators of the exchange for many years.

Payrolls Show Large Increase

The total payroll of the telephone and telegraph industries shows the largest proportionate gain over 1929 for the month of October of any large American business, with the exception of the bituminous coal industry, figures released by the Labor Department for October reveal. The telephone and telegraph industry shows a total payroll index of 117.6, using 1929 as 100 in the tabluation. The payroll figures show a rise of 0.3% over September, 1941, and 15.1% over the corresponding month last year.

While payrolls in the industry are up sharply over 1929, total employment for October was 90.6% of the 1929 mark. This, however, is an increase of 0.3% over September of this year, and a rise of 14.6% over October, 1940.



SANDS

PROTECTED CABLE TERMINALS

Name the features that telephone men want most in a protected cable terminal. SANDS terminals have them all — including the famous Type 2105 self-grounding and automatic resetting discharge block.

This unique SANDS discharge block not only guards unfailingly against all dangerous potentials, but resets itself automatically after discharge, too. Thus, protection lapses are banished — maintenance costs are cut. That is why SANDS terminals are first choice among so many operating companies.

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TELEPHONE SIGNALING AND COMMUNICATION APPARATUS

COMMUNICATIONS and ELECTRONIC Developments

AN ingenius device now used by the Bell System in connection with buried telephone wire enables the detection of faults which occur at the time the wire is being ploughed into the ground.

Experience has shown that in buried wire construction faults such as opens, faulty insulation, etc. are apt to occur at time of installation rather than afterwards, hence some means of detecting these faults at the instant they occur is preferable to attempting to detect and locate them after the wire is in place.

The new test set devised for this purpose is carried on the wire laying plow and is connected to the inside end of the wire on the reel. (The reel is stationary). One terminal of the test set is grounded on the plow.

By means of a cold cathode gaseous discharge tube any fault will "trip" the tube causing a relay to operate and a bell to ring. The plow is immediately stopped and the wire pulled out of the ground for a few feet back of the plow and the fault readily located and corrected.

The simplified schematic of the test circuit is given in Figure 1.

Referring to this circuit it will be noted that the control gap is connected across a voltage divider network consisting of Resistor R1, the resistance of the buried wire R2 and R3, and resistor R4. With everything normal current from a small 135 volt radio type battery flows thru R1, R2, R3 and R4, setting up a voltage drop between the main gap and the control gap of the tube of such value as to prevent it from ionizing (passing current). If either wire breaks this opens the network causing full voltage to appear across the control gap and the tube ionizes causing current to flow in the relay circuit thereby operating the signal. Even though the ends of the broken wire might again make contact, the tube will remain in the operated condition and can only be restored to normal by opening the battery circuit.

If the fault is due to a leak to ground, this results in an increase in current through resistor R4 and the resultant voltage drop across this resistor changes the voltage on the control gap causing the tube to trip and operate the signal.

It is said that the testing unit now available has sufficient sensitivity to detect a 20,000,000 ohm leak to ground.

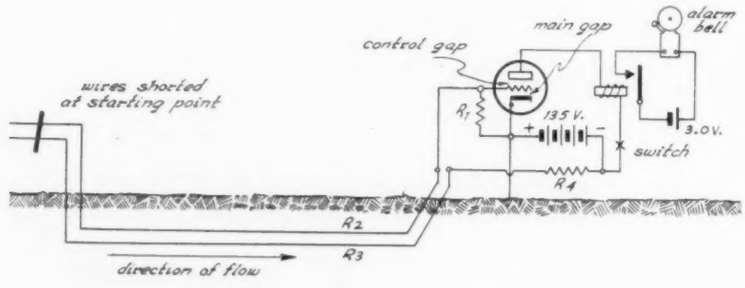

Figure 1—Simplified Circuit of Test Unit Used to Test Buried Wire at Time of Installation.

No Such Number Tone

TONES have been used for years to give an audible signal to the subscriber that certain signaling conditions exist. For example, a **reverting tone** is used to notify the subscriber that the called party is being signalled. A **busy tone** tells that a line is busy. A **dial tone** tells that it is alright to start dialing. Most of these tones consist of either continuous or periodically interrupted complex tones.

There has been developed and is now in use on the larger systems a new and distinctively different tone that notifies the subscriber that there is no such number as the one dialed. The need for a **no such number** tone originates on dial systems from the fact that a subscriber may through error dial some number combination that doesn't exist. The unique feature of the **no such number** tone is that instead of being a fixed frequency either constant or interrupted, the new tone consists of a complex tone whose fundamental frequency varies between 200 and 400 cycles at half second intervals. The alternately rising and falling tone which sounds like a siren is very distinctive and is readily recognized by the subscriber.

Ths rising and falling tone is obtained by means of a vacuum tube oscillator whose frequency is controlled by the charging characteristics of a condenser-resistance combination. A relay which opens the circuit each half second starts a new train of oscillations.

Tests on Lashed Cable

PUBLISHED reports on tests made on lashed cable (cable fastened to the messenger by means of spirally wrapped wire) have developed some important facts in connection with this type of construction, viz:

1. When cable is being placed by this method all waviness, bends, etc. should be removed before the cable is lashed in place. This can be accomplished by applying medium tension to the cable as it is pulled out or by pulling it thru a special tubular cable straightener which is fastened to the messenger and pulled ahead of the lashing machine as the cable is placed.

2. The tension of the strand should be relatively low in order to minimize bowing (excess slack forming loops in

cable at pole or in span). With low strand tension there is less difference between the thermal expansion of the lead cable and the steel strand, hence less tendency for the cable to bow.

3. It is thought that the lashing method will confine the expansion of the cable to minor bows throughout the span rather than allow an excess of slack to accumulate at the pole to cause sharp bends.

4. It is believed that there will be less abrasion at the poles due to swinging and vibration if the cable is left unsupported at the pole for a distance of approximately 15 inches each side of the pole. To accomplish this the strand and cable should be bound together with a zinc type support strip at the end of the lashing wire and the wire carried over the support belt where it is spliced to the wire in the next span.

Vicalloy a New Magnetic Alloy

A NEW magnetic alloy known as **Vicalloy** which was announced some time ago by one of the large research laboratories promises to have wide application where a commercial magnetic material of high quality is required. It is said that the new material will hold more magnetism than virtually any other commercial material. The new alloy is composed of cobalt, vanadium, and iron, and has the distinct advantage over many other good magnetic alloys of being readily drawn or rolled. It is especially useful for making small powerful magnets.

"See if you don't think Mr. Jones sounds a bit cool."

Rebuild Phone Lines

Wiota, Ia.—The Wiota Telephone Co., is making extensive improvements on its lines due to the recent installation of parallel R.E.A. lines, which cause them to be noisy. Over 50 miles of telephone lines are being metallicized.

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CREOSOTED PINE POLES
T-C Poles Are
SMOOTHIES
To this strange contrivance T-C poles owe their finished look. It is one of several trimming machines built by Taylor-Colquitt Company through which poles are rotated to give them a smooth surface.
T-C poles not only are good looking but they will stand up for many, many years. And remember, long life means lower cost per year of service.
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Highlights of Communications News

(Continued from page 18)

Hotel Rates

CHALLENGING the FCC jurisdiction over the special service charges made by hotels, apartment houses and clubs for interstate and foreign telephone service, and declaring that the latter establishments, not being common carriers or furnishing telephone service, are not subject to regulation, the American Telephone and Telegraph Co. and the Chesapeake and Potomac Telephone Co. filed responses early in February respectively to the Federal Commission's order of Jan. 6 requiring them to show cause why these special charges in the District of Columbia should not be under its regulatory jurisdiction.

The FCC has indicated that, if it is held that the District of Columbia interstate long distance rates are under its jurisdiction and that such hotel special charges should be filed in telephone company tariffs, this Washington inquiry would be broadened into a nationwide investigation. The District of Columbia Public Utilities Commission simultaneously launched a similar jurisdictional inquiry into hotel charges for local exchange service and D. C. Chairman Hankin asked that a joint cooperative hearing of his Commission and the FCC should be held on the question.

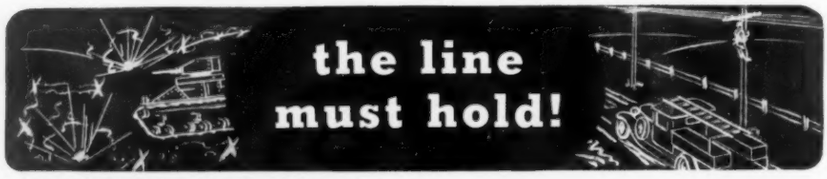
The A. T. & T. and C. & P. answers stressed that these special charges for telephone service by the hotels, apartment houses and clubs were not part of the revenues of the telephone companies and were imposed by the hotels, etc. for furnishing service to their customers and guests. The regulation of these charges would be most difficult and impractical to regulate, the two telephone companies stated, declaring that "any attempt by the Commission (FCC) to control the special charges made by hotels, apartment houses and clubs through tariff filings of the telephone companies would not be in the public interest nor in accordance with sound administrative procedure; but, on the contrary, such attempted control would be unduly burdensome to the telephone companies and impractical to enforce."

The two telephone companies held that the special charges were specifically not interstate telephone rates under the jurisdiction of the FCC. If they were held to be charges for public telephone service, the companies cited they would be classified as "wire telephone exchange service" specifically excluded from the Communications Act. "If this Commission (FCC)", the telephone companies stated, "should undertake to regulate such charges through tariff filings of the telephone companies, it would thereby invade a field long subject to the jurisdiction of state commissions and local governmental authorities, and in fact regulated by such bodies, in violation of the policy declared by Congress in enacting Section 221 (b) of the Communications Act of 1934." The A. T. & T. answer specifically contended that the hotel rates, if found to be charges for public service, would be under the jurisdiction of the Public Utilities Commission of the District of Columbia.

"Any special charges that may be paid to hotels, apartment houses, and clubs in the District of Columbia in addition to message charges are fixed, collected, and retained by such hotels, apartment houses, and clubs on their own initiative and for their own purposes," the A. T. & T. and Chesapeake & Potomac pointed out. "Such special charges are not charges of respondent or its connecting telephone companies, are not made by their authority or for their account, and are not charges for public telephone service, and particularly, are not charges for interstate and foreign toll telephone service."

It was contended that the hotels, apartment houses, and clubs are not engaged in the telephone business, are not common carriers, and cannot and do not furnish telephone service to their guests, tenants, and members. The special charges, it was declared, are "for services other than telephone service."

The answers recalled that all charges in connection with interstate and foreign toll service which may be utilized on the promises of hotels, apartment houses, and clubs have been filed with the FCC. Companies connecting with the Chesapeake & Potomac and A. T. & T. lines have also filed the necessary tariffs. However, rates for interstate interzone message service within the Washington Metropolitan Exchange Area, which were filed by the Chesapeake and Potomac with the FCC



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under protest, and those for other services which may be utilized in hotel, apartment house, and club service are charges for wire telephone exchange service and thus exempt from the Commission's regulatory authority. The A. T. & T. answer was filed by General Attorney T. Brooke Price and Edmund S. Hawley, while Vice President and General Counsel R. A. Van Orsdel and Bolling R. Powell, Jr., filed the C. & P. response.

(END)

Communication Technicians Needed by Government

The United States Civil Service Commission has just announced examinations for two types of positions for persons experienced in communications work. The first is for telegraph operator, $1,800 a year, and the second for communications machine operator (multiplex, simplex, or teletype), $1,620 a year. The Commission expects various Government agencies to make heavy demands upon the employment lists established as a result of these examinations. All the appointments will be made in Washington, D. C., and vicinity.

Applications must be on file with the Civil Service Commission, Washington, D. C., not later than March 3, 1942. Copies of the examination announcement giving full instructions for filing, and application forms, may be obtained at first- and second-class post offices, or from the Commission's central office in Washington.

SPRING CONSTRUCTION

Turn to page 46 for details

Order Extra Copies — NOW

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MASTER RINGING CONVERTER

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New Horizons in American Communication

By A. UELAND

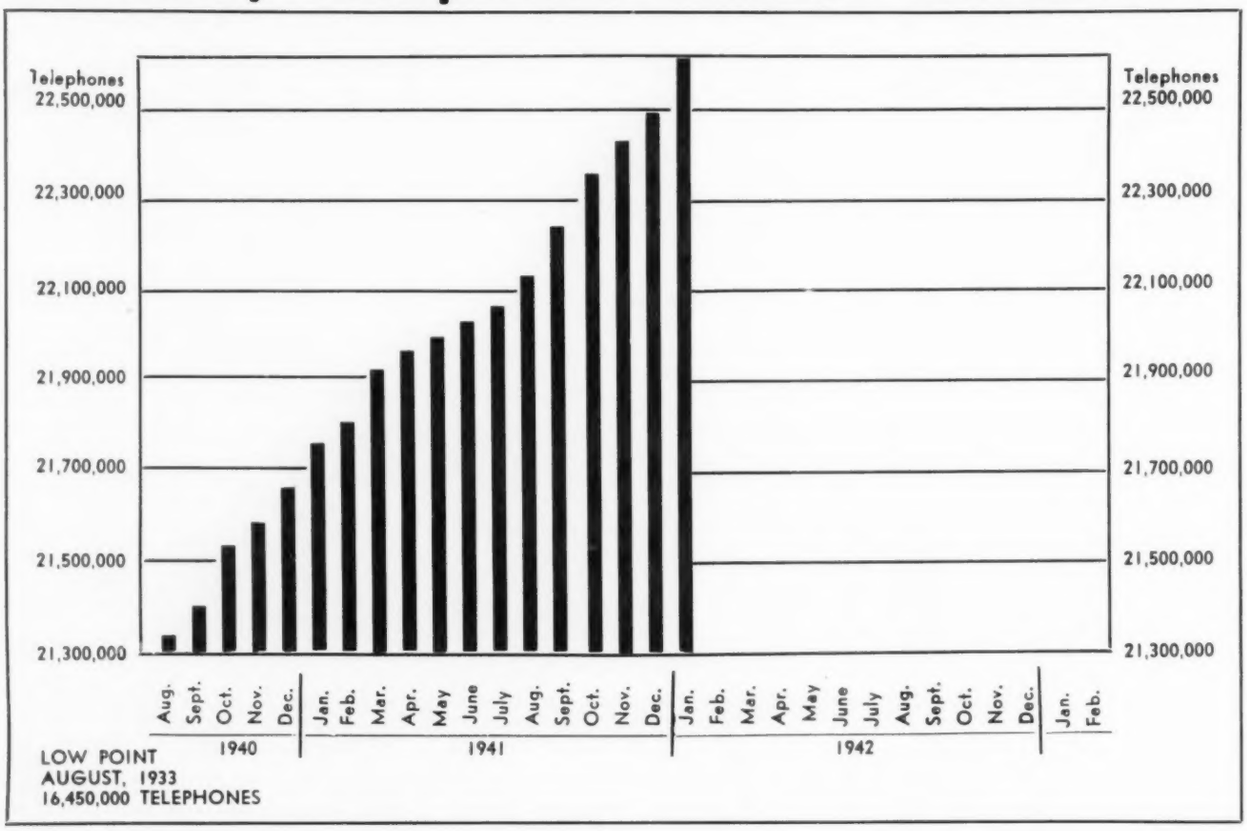
SHAKESPEARE predicted radio over three hundred years ago. In his play, "A Midsummer Night's Dream," which abounds with fairies, gnomes and woodland sprites, the inimitable Puck says, "I'll put a girdle around the earth in forty minutes." Radio waves travel at approximately the same speed as light, or 186,000 miles a second. In experiments conducted by the American Telephone and Telegraph Company, the human voice encompassed the globe in a quarter of a second.

The Mayan and Aztec Indians, before the arrival of Cortez, frequently sent communications several hundred miles. They were relayed on the same principle as the Pony Express. Fish were transported daily from the Gulf of Mexico to Mexico City in that manner. The natives of Africa to this day transmit messages by means of drum-beats. Over 600 languages and dialects are spoken in that continent, and messages are known to have been relayed 1,000 miles by the universal language—the drum "telegraph"—in a little more than an hour. A study of the methods of communication used by the ancient Chinese, Egyptians, Greeks and Romans would be interesting. During 1797, a letter sent to George Washington from Boston, on March 21st, did not reach him at Mt. Vernon until the early part of June. The Battle of New Orleans was fought by Andrew Jackson in 1815, two weeks after peace had been signed, owing to the lack of communication.

The United States has the finest communication system in the world. It has almost one-half of the telephones in the world. New York City alone had 1,669,904 as of January 1, 1940, in comparison with 20,888,823 for the balance of North America, 957,112 for South America, 15,765,994 for Europe, 430,699 for Africa, and 2,929,720 Asia and Oceania. The domestic telegraph mileage in the United States exceeds that of any other country and, through cable facilities and radiotelegraph circuits controlled by American interests, communication service is maintained around the globe. This system is very important, from a defense standpoint, during these troublous times. In addition, there are approximately 56,300 licensed, amateur radio stations in the United States. About one-half of the radios in use throughout the world are in the United States. There are approximately 29,400,000 radio homes with 11,000,000 secondary sets, 8,000,600 automobile sets, and 1,800,000 portable sets in use at present.

The following financial data may be of interest: the annual revenue, in 1940 of the New York Telephone Company was $218,734,706, whereas the revenue from the sale of time (before commissions) of the three major radio networks, five regional networks, and 765 broadcast stations was $154,823,787. Operating and excise taxes collected from telephone carriers, during that year, amounted to $217,447,830, while the gross operating revenues of telegraphs, cable and radiotelegraph carriers were $145,570,832. Modern methods of communication are used in connection with the operation of

Monthly Telephone Station Barometer



trains, airplanes, vessels, and pipe lines, for transmitting press messages, wirephoto service, teletypewriter messages, control of forest fires, and in police activities.

On Christmas Eve, 1906, a program was broadcast at Brant Rock, opposite Cape Cod, in Massachusetts. KDKA at Pittsburgh, Pa., commenced broadcasting on November 2, 1920. The microphone used to broadcast the Harding-Cox election returns on that occasion has been placed in the Smithsonian Institution. At present, call letters assigned to stations east of the Mississippi commence with W, and west of the Mississippi with K. The United States Navy and Coast Guard use call letters beginning with N. There are now approximately 912 broadcast stations in the United States.

As a result of a conference held at Havana, Cuba, during 1937, between representatives from Canada, Cuba, Dominican Republic, Haiti, Mexico, and the United States, an agreement was reached for re-allocating the frequencies, which will minimize interference and improve the quality of broadcasting. Changes were made effective on March

Broadcasting facilities penetrate into programs originating at distant stations are transmitted over the telephone circuits of the Bell System and relayed by the local station.

The method of broadcasting principally used at present is termed AM, or amplitude modulation, whereby the signal is radiated into space from the antenna and the amplitude (or power) varies, but the frequency remains constant. A new system called FM, or frequency modulation, has been developed with constant amplitude, but variably frequency. Construction permits have been authorized for about 49 stations to use the FM

Drop Wire — Bridle — Interior — Tree — Ground — Switchboard — Pothead — Cable Terminal — Instrument — Fixture — Buried Wire

Wind-Sleet-Storm

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WILL STAND
THE STRAIN

ACORN'S exclusive Carton packaging preserves carefully developed QUALITY until installed.

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ELECTRIC COMPANY
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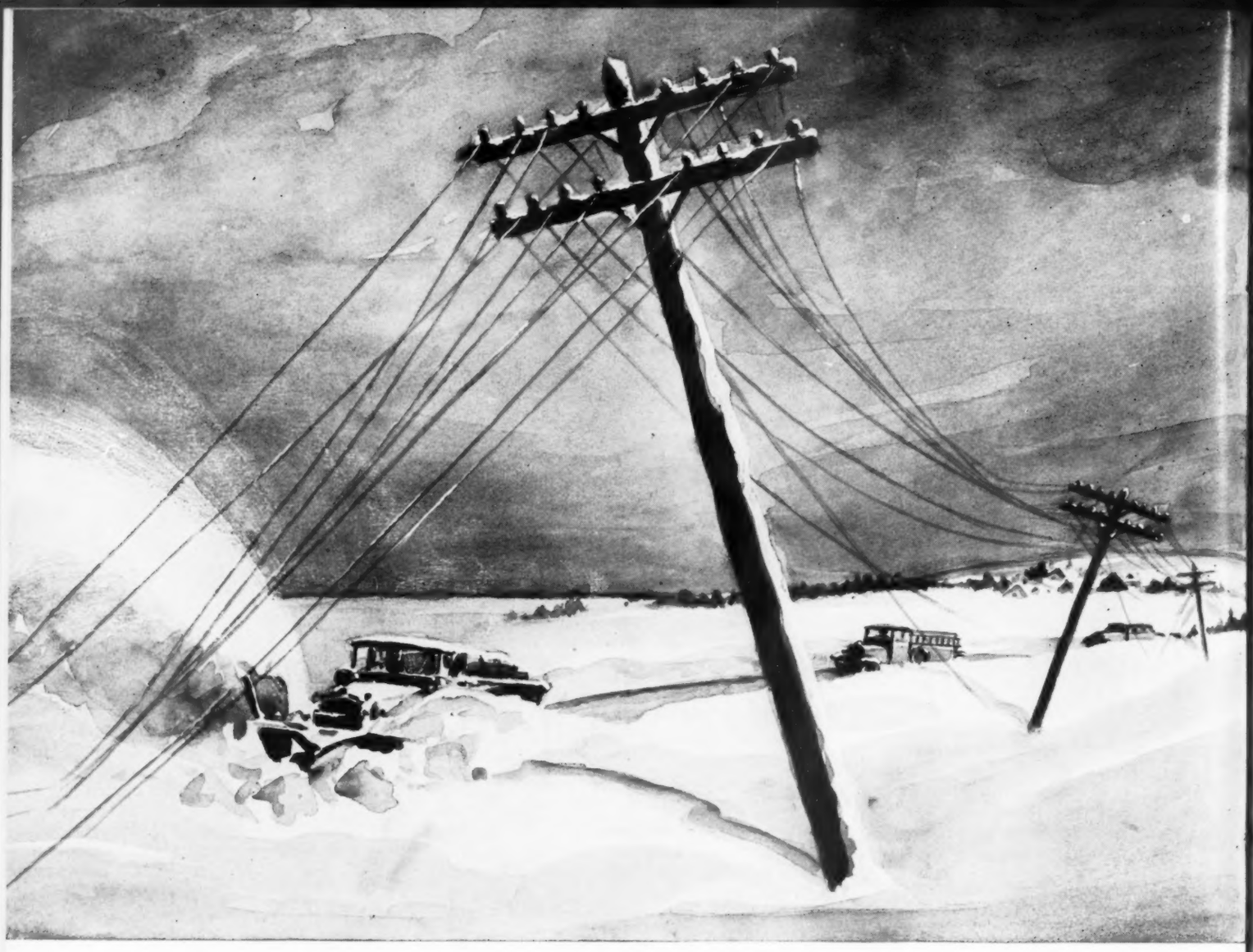


Just like the automobiles following the snow plow –

SPRING follows WINTER

– then comes spring construction

FOR new ideas—new products and hints at how to better use materials you might have on hand in your new and re-construction work—watch for the BIG

SPRING CONSTRUCTION ISSUE

as usual — in your

APRIL 15, TELEPHONE ENGINEER

method of broadcasting. It eliminates static and brings in the sound waves clearly and distinctly. The Yankee Network, operating in New England, has been experimenting with FM, and reports favorable results. Probably several years will elapse before national networks are developed to handle FM programs. Notwithstanding, several manufacturers are offering sets capable of receiving either AM or FM programs.

Broadcasting facilities penetrate into remote sections of the country, reaching all classes of people. The programs create an interest in classical music, literature and drama; improve health and public welfare; stimulate business through advertising; disseminate current information about civic problems; educate the masses, and make for better citizenship.

The Federal Communications Commission does not have the power to censor programs offered to the public, except to insure that they do not verge on the obscene, indulge in profanity, pertain to lotteries, or discriminate in favor of one political party. When listeners object to a certain program, they can manipulate the dial and tune in another program. The National Association of Broadcasters has adopted a code of ethics to improve standards of conduct in the industry.

A considerable amount of experimental work in television has been carried on by various organizations. A demonstration was given recently, over a coaxial cable or "television pipe," from Philadelphia to New York. Prior to present hostilities abroad, television programs were presented by the British and German Governments regularly. The Commission would not authorize commercial presentation of television last year as programs would be offered by several organizations, and it would have been necessary to purchase a separate set to watch each program. This difficulty has been remedied to some extent, and standardization and commercialization will soon become effective. One manufacturer recently announced the production of television sets for reception of programs in color.

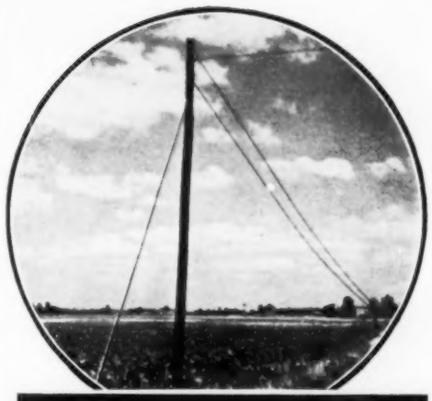
At a banquet held during November, 1940, in Washington, commemorating the 20th anniversary of broadcasting, it was predicted that within a few years a cabinet could be purchased for as low as $300, capable of printing a newspaper, showing television in color (and possibly even bring the perfume of flowers), making records of symphonic programs from foregn capitals to be played subsequently on the phonograph for the enjoyment of friends; also to receive facsimile messages. These innovations are bound to have an important social and economic effect on the structure of our country.

Dissecting Foreign Radio Propaganda

For the first time in history the United States Government, through special national defense units of the Federal Communications Commission, is officially "listening in" and dissecting foreign shortwave broadcasts.

The Foreign Broadcast Monitoring Service, created by the Federal Communications Commission in cooperation with the Defense Communications Board, is now actively translating, transcribing, analyzing, and reporting on from 600,000 to 900,000 words transmitted daily by foreign broadcast stations throughout the entire world as recorded by the Commission's National Defense Operations Section.

Working in three shifts of eight hours each, a special force of technicians, translators, analysts, and other experts is keeping abreast of all international broadcasts which emanate outside of this country, 24 hours of the day, 7 days a week. Speeches, newscasts, and entertainment to the inclusion of some musical programs, are carefully watched for intelligence and trends, which are reported immediately to Government officials responsible for counter-propaganda or other action, if necessary.



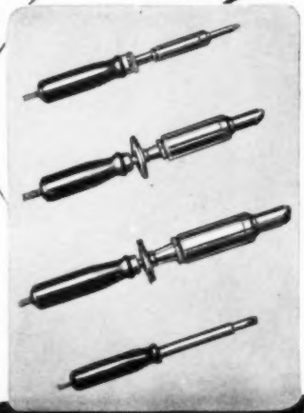
Crapo
GALVANIZED PRODUCTS

TELEPHONE WIRE
STEEL STRAND

● Crapo Galvanized Line Wire and Crapo Galvanized Steel Strand combine strength, ruggedness and durability with low first cost, low maintenance expense. Crapo HTL-85 and Crapo HTL-135 High-Tensile, Low-Resistance Line Wires have made possible new, long-span construction. Crapo Galvanized Steel Strand for years has been first choice of many leading utilities for guying and messenger purposes. Ask the jobber of Crapo Galvanized Products near you or write—

INDIANA STEEL & WIRE CO.
MUNCIE, : : INDIANA

"LEADING THE PARADE"—
AMERICAN BEAUTY
SOLDERING IRONS



It's easy to pick the points that put American Beauty irons in front. They're light-weight, quick-heating, practically indestructible and beautifully balanced. Elements are superior — copper tips are easy to replace. It pays to use American Beauty.

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INSTALL & REPAIR CABLE

Faster ... Easier with

★ DAVISON'S ★

PROTEK-SORB DESICCANT

Protek-Sorb Desiccant has more than twice the moisture capacity of other desiccants—splices dried with Protek-Sorb Desiccant MUST be drier, MUST return to normal insulation resistance quicker.

Protek-Sorb Desiccant is approved and recommended by leading manufacturers and suppliers of telephone equipment.

Use Protek-Sorb Desiccant—avoid the hazards and inconveniences of out-dated methods of drying cable splices.

Your regular telephone jobber can supply you. Ask him for handbook instruction sheets.

THE DAVISON CHEMICAL CORPORATION

INDUSTRIAL SALES DEPARTMENT

BALTIMORE · MARYLAND

ALBERT'S ELECTRICAL COMMUNICATION

By ARTHUR L. ALBERT

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SECOND EDITION

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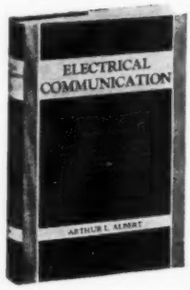
Price $5.00



A study of the various specialized phases of electrical communication as related to the usages of modern communication systems. Nearly one-third of the content has been entirely rewritten and the remainder revised to incorporate recent advances. The main revision occurs in the chapters on Sound and Acoustics, Speech and Hearing, Electronics and Vacuum Tubes, Inductive Interference and Plant Protection, Electronic Applications in Wire Communication (especially the sections on Carriers and Repeaters), and Wireless Communication.

Order From Book Department

TELEPHONE ENGINEER

Telephone Engineer HANDBOOK TABLES

File—General
Date—Feb. 15, 1942

By B. C. Burden

Measure and Weight Data

Linear Measure

12 inches = 1 foot
3 feet = 1 yard
5½ yards = 1 rod
40 rods = 1 furlong
8 furlongs = 1 mile
5280 feet = 1 mile

Square Measure

144 square inches = 1 square foot
9 square feet = 1 square yard
30¼ square yards = 1 square rod
160 square rods = 1 acre
640 acres = 1 square mile

Cubic Measure

1,728 cubic inches = 1 cubic foot
27 cubic feet = 1 cubic yard
128 cubic feet = 1 cord
1 cubic yard = 27 cubic feet

Weight—Troy

24 grains = 1 pennyweight
20 pennyweights = 1 ounce
12 ounces = 1 pound
1 pound = 5,760 grains

Weight—Avoirdupois

437½ grams = 1 ounce
16 ounces = 1 pound
100 pounds = 1 hundredweight
2000 pounds = 1 ton
2240 pounds = 1 long ton
1 pound av. = 7000 grains

Measure of Angles or Arcs

60 seconds = 1 minute
60 minutes = 1 degree
90 degrees = 1 right angle or quadrant
360 degrees = 1 circle
1 minute of arc on the earth's surface = 1 nautical mile.

Dry Measure

2 pints = 1 quart
8 quarts = 1 peck
4 pecks = 1 bushel

Liquid Measure

4 gills = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon
31½ gallons = 1 barrel
1 gallon = 231 cu. in.
1 cu.ft. = 7,481 gallons
1 gallon weighs 8.45 lbs.

Miscellaneous

12 dozen = 1 gross
1 league = 3 miles
24 sheets = 1 quire
20 quires = 1 ream

LETTERS

from TELEPHONE ENGINEER readers

Dear Mr. Smith:

Please find enclosed money order for one year subscription to "TELEPHONE ENGINEER." In the past it has been possible to see the copy the company sends out to the test board but I guess it is so popular with the maintenance and construction it does not stay long.

How is the situation regarding the "Wire Chief's Training Course" . . . is it too late to start? I am wire chief here in charge of maintenance and construction. We have three offices, 2 dial unattended and one 1000 line manual, and are busy cutting over another dial office of 350 station at the present time.

The D. B. meter and 1000 cycle oscillator described in your October 1940 issue certainly worked out good. We use it every day on our transmission tests and, of course, we tie into the Bell toll center and have to keep our line loss within certain limits.

If you can advise me about the course, I would like to take it and if too late send the next issue as soon as possible.

Yours truly,
W. J. Ure
Oxnard, California

Dear Mr. Smith:

I find the "Telephone Engineer" a great help. It is full of live information. Should I find it necessary to consult you for special information I will certainly avail myself of the privilege.

J. M. Duffy
Hannibal, Mo.

Dear Mr. Smith:

I always look for TELEPHONE ENGINEER before any other magazine. The Questions and Answers are very interesting and furnish a lot of good information. The ads cover a lot of territory, too.

It is through the TELEPHONE ENGINEER that I got the job where I now work.

Yours truly,
Henry Seidel
Pine Grove, Pennsylvania

Dear Mr. Smith:

Enclosed find my check in payment of one copy of Drakes Telephone Handbook.

I was very much interested in your article (October issue, page 76) on "noise due to longitudinal effects."

Very truly yours,
John W. Orr
Belle Mead, N. J.

Government Survey Shows Only 0.7% of Income Spent by Families for Phone Service

The American people spent only 0.7% of their personal income for telephone service in 1935-36, a report on national income and consumption for those years by the National Resources Planning Board reveals. However, the $320,000,000 spent for residential telephone service, averaging $11 a family, amounted to 6.7% of the nation's household operations budget. Telephone service accounted for 0.8% of all consumption expenditures, the differential appearing because of savings, etc.

It was also learned that urban families spend twice as much on the telephone as farm families with comparable incomes, the proportion running even higher in the larger income brackets. In the $500-$1,000 class, for example, farm families spent $2 to the average city dweller's $4. In the $1,500-$2,000 bracket, the proportion was $8 to $17, but the average went up to $37 for urban families in the $3,000-$4,000 group, compared with $11 for the farm groups. In the $5,000-$10,000 classifiication, the differential was $57 to $16.

New Philco Amplifier

A new, portable sound amplifier has just been introduced by Philco.

"The new amplifier is compact and neat in appearance," according to Chas. F. Gerhard, manager of parts sales at Philco, "and it is also powerful."

Another feature of the new amplifier is its lapel microphone. A spring clip holds the microphone securely in lapel or shirt pocket, enabling vocalists and entertainers to move about the stage without walking away from the microphone. A stand microphone is also available if desired.

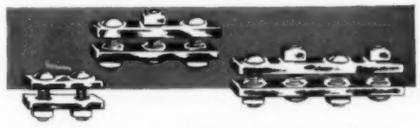
The new model requires no elaborate preparation or complicated wiring. It plugs into any 110 volt, 60 cycle outlet. Its output is rated at 15 watts.

6% Service Tax Totaled

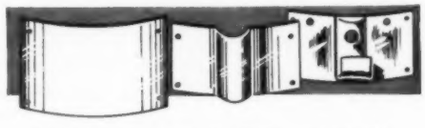
In the first full month of its existence, the 6% levy on local telephone service brought the U. S. Treasury $223,159, a statement of excise tax collections for the month of November, released by the Bureau of Internal Revenue Dec. 23, reveals. Levies on interstate and foreign telephone, telegraph, cable, and radio traffic amounted to $3,062,877, compared with $2,733,066 for the same month last year, the increased collections being due to the higher tax rates. Total collections for the month were $573,414,870, against $444,383,263 for November, 1940.

. . . from the
COMPLETE LINE OF
OLIVER
POLE LINE MATERIALS

GUYING MATERIALS
that simplify and speed Line Installation

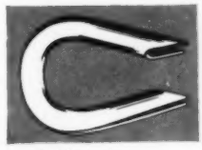


GUY CLAMPS . . . Light or heavy types, long clamping surfaces, greater wrench clearance.



STRAIN PLATES . . . Three types—standard; moulding (formed to fit 1" NELA std. ground wire moulding); guy hook.

GUY HOOKS . . . . Made from half oval steel bent with flat side toward pole to protect guy wire.



GUY THIMBLES . . . Grooved for strands 3/8" to 3/4" incl. Generous radius prevents kinking.

EYENUT THIMBLEYES . . . Drop forged, threaded eye nuts having many useful applications.

ALL Oliver Guying Materials are made from specified steels, finished to accurate dimensions and protected by heavy hot dip galvanizing. Designed by experienced engineers, they are readily installed, long lasting.

OLIVER IRON AND STEEL Corporation
Makers of Pole Line Hardware Since 1894
PITTSBURGH, PENNSYLVANIA

Price Ceilings Set by Leon Henderson

Formal price ceilings for manufacturers of wire and cable, including telephone, telegraph, and signal cable and wire, and noncommercial radio and television receiving sets, parts and tubes were established last fortnight by Price Administrator Leon Henderson. The price schedule for wire and cable is based on levels existing Oct. 15, and promulgates officially the informal request made Oct. 29 to the cable and wire manufacturing industry, requesting it to maintain prices at the Oct. 15 levels.

Included in the wire, cable, and cable accessories coming under the price ceiling order are telephone and telegraph wire suitable for either inside or outside installation; telephone, telegraph, or signal cable; and special purpose communication or signal wire and cable. The schedule was prepared following three conferences with industry representatives and the study by the OPA staff of written comments on a proposed price schedule previously submitted to all members of the industry.

The Price Control Act in its final form exempted specifically telephone and telegraph rates.

UNINTERRUPTED SERVICE

with Non-Grounding Rare Gas Arresters

Used for many years by leading Railroads for vital Telephone, Telegraph and Signal Circuits.

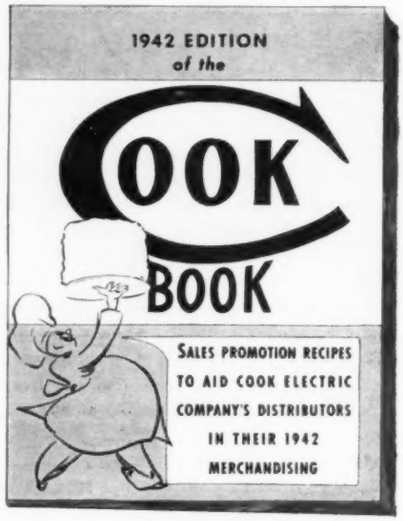
Type MCD (illustrated) interchangeable with your present carbon block protectors.

Write for Catalog 39-A describing
Arresters Anti-Noise Relays
Terminal Strips Potheads Housings

L. S. BRACH Mfg. Corp.
55-63 Dickerson St. Newark, N. J.
Signal Circuit Engineers Since 1906

Headsets in "Tin Hats"

A "tin hat" which accommodates telephone headsets has been designed for communications personnel by the Navy. The steel helmet, a good indication of the advances over the first World War attendant to the present conflict, is somewhat heavier than the ordinary hat, and is provided with a curved flange at the back to protect the neckline. The new design will be used as a model in equipping Army and Navy signalmen and civilian air raid spotters.



Cook Electric Company Issues "The Cook Book"

Telephone jobber salesmen have a new surprise awaiting them in the 1942 edition of the "The Cook Book" just issued by the Cook Electric Co., 2700 Southport Ave., Chicago. It is an illustrated and colorful brochure which serves the double purpose of acquainting the manufacturers and supply houses with new products in the Cook line for the telephone industry plus their plans for sales promotion of these products during the year.

It is conspicuous in these promotion plans outline in the "Cook Book" that full-page advertising will appear in each issue of TELEPHONE ENGINEER and Fortnightly TELEPHONE ENGINEER during the year. In this manner there will be over 408,000 reminders of Cook products seen in the magazines during the year.

Copies have been sent and received enthusiastically by supply house salesmen and Cook company officials feel that the "recipes" in the "Cook Book" will be of much value to them during the year.

Helpful Hint

To correct bad sparking at the contacts of a harmonic ringing machine, Mr. Harlan Grimes of the Clinton Telephone Co., Wilmington, Ohio, resorted to a resistance-condenser combination shunted across the operating contact. This reduced the sparking to a negligible amount and improved the ringing machine's performance. A 500 ohm non-inductive resistance in series with a .04 MF was uesd.

SERVICING MUST BE MINIMIZED—SO IT'S . . .

ROEBLING TELEPHONE CABLE

Even under ideal installation conditions, a telephone cable will be called on to withstand abrasion—such as hanger wear or occasional rubbing action of tree limbs.

That's why Roebling pays such special attention to lead sheathing—applies it under ideal metallurgical conditions—to the exact analysis and dimensions most suitable for your requirements. Then inspects it thoroughly—to be certain that the electrical and physical characteristics will be retained through years of service.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY
Branches in Principal Cities

JAR ROEBLING

MANY OTHER TYPES

of Roebling Telephone Wires and Cables are made in our mills under complete Roebling Supervision and inspection, including Zinc-coated Line Wire, Steel Strand, Drop Wire, Interior Wire, Switchboard Cable, Wire Ropes and Fittings.

Standing from left to right are: Jack Musgrove, D. E. Argo, E. W. Ober, J. C. Blanton, W. A. Moss, O. E. Walker, N. A. Toalson, G. M. Hughes, E. D. Thatcher, H. A. Houston. Seated: V. E. Coe, D. C. Hubbard, Stuart Walters, J. S. Curtright, E. G. Ryman, J. T. Isbell, F. G. Chance, O. G. Anderson, J. R. Rice, C. L. Clark, and C. C. Musgrove.

Sales Meeting

These are the sales representatives and some of the executives of the A. B. Chance Company as they assembled for a 4-day sales meeting to study business conditions, priorities, etc. One of the chief purposes of the meeting was to enlighten the A. B. Chance Company representatives on the subjects which cause so much confusion among those whose job it is to buy construction and maintenance equipment for public utilities. As a result of the meeting these A. B. Chance Company representatives are better equipped to help customers solve their many new problems.

New Equipment Installed

E. A. Tull, owner and Manager of the Lapel (Ind.) Telephone Company gave his customers a splendid Christmas present of faster and better service through the use of the new central office equipment recently cut into service. The new board will accomodate about 600 stations, and 340 lines are now equipped.

Free Insurance Benefits

The Free accident insurance policy given all members of the Independent Pioneer Telephone Assn. who pay their annual dues in advance has proven very valuable to a number of these members during 1941, according to J. K. Johnston, secretary-treasurer, in a report made at the end of 1941 to this publication. New members are all given this free accident policy and are automatically renewed when dues are paid each year before the date of expiration of the policy.

Around twenty Pioneers or their beneficiaries collected benefits ranging from $500 down to $10 on this policy that is proving such a worthwhile gift to Pioneer members. If you are not already enrolled as a member of the Independent Pioneers write J. K. Johnston, Lemcke Bldg., Indianapolis, Indiana, and get application blanks and details of membership. The cost is so low that every Independent telephone man and woman should be a member.

Philco Appointment

J G. Green of Milwaukee, Wisc., has been made Assistant General Manager of the Storage Battery Division of Philco Corporation according to a recent announcement by M. W. Heinritz,

This job is done on the ground . . .

. . . when Chance Guy Fixtures are used

Chance Thimbleye Guying Fixtures make possible a simple, safe, economical, and dependable method of guy attachment.

Simple — Because guys may be made up on the ground before being mounted on poles.

Safe—Because there is no hazard of loose, flying ends of cable.

Economical—Because several feet of strand is saved on each installation by doing away with the old wrap around method.

Dependable — Because their drop forged eyes eliminate sharp bends which cause kinks and breakage, thereby giving maximum strength

Use Chance Guying Fixtures individually or in interchangeable combinations, and life to the guy.

A·B·CHANCE CO·
CENTRALIA MISSOURI

ESTWING
UNBREAKABLE
TOOLS

ONE-PIECE STEEL HEAD —HANDLE WITH NON-SLIP GRIP OF SOLE LEATHER WASHERS

Balance

That Gives Power to Each Stroke

Like all Estwing Tools, this perfectly tempered Hand Axe is properly balanced to insure the most effective stroke.

May be had in High Polish or Velvet Black finish. Leather belt sheath included.

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AMERICAN
AUTOMATIC ELECTRIC
SALES COMPANY

1033 WEST VAN BUREN STREET · CHICAGO, ILLINOIS

BRANCH WAREHOUSES AT DALLAS, KANSAS CITY, LOS ANGELES, RICHMOND (VA.) AND SAN FRANCISCO

The Clearing House

For the convenience of readers of Telephone Engineer

LOOMIS ADVERTISING CO.

A SALES ORGANIZATION *Exclusively..*

That Has Never Failed to Produce More Net Revenue (All Costs Considered) for Telephone Companies Served.

IF INTERESTED in more net telephone directory revenue write or call at our expense.

LOOMIS ADVERTISING CO.

Telephone Bldg., Kansas City, Mo.

Citizens Trust Bldg., Fort Wayne, Ind.

135 So. Second St., Philadelphia, Pa.

Reconstructed Equipment

Kellogg No. 8A Talk through type repeating coils @	$ 0.75
Western Elec. No. 80B Repeating Coils @	4.50
Western Elec. No. 71A, C, or B types Retard Coils @	1.25
Gray No. 11 or No. 7 3 Slot Paystations, Price on application	
Kellogg Drops and Jacks 5 per strip—Practically all types, Per strip @	8.25
Kellogg No. 2800 4-bar 1000 or 1600 ohm compacts @	9.25
Stromberg Carlson latest type No. 896 3-bar 1000 or 1600 ohm Compacts @ $8.00—4-bar @ $9.00—5-bar @	10.75
Western Elec. No. 20 desk set with Connecticut 3-bar 1000 ohm ringer external post connection signal set @	8.75
Stromberg Carlson No. 992 desk stand with 3-bar 1000-1600 or 2500 ohm ringer inside connection signal set @ $8.75—4-bar $9.50—5-bar @	11.00
Western Elec. No. 20 C. B. Ind. Coils 35c ea. No. 46 @	.50
Western Elec. No. 1801 C. B. PBX Swbd. price and description on request	
Western Elec. No. 323 Transmitters less back $1.10 with Back @	1.25
Kellogg No. 22 C. B. or Local Battery Transmitters with Back @	1.10
Kellogg No. 41 Receivers with New shell and cord @	1.25
Kellogg No. 115 Grabaphone hand set with 3 Cond. cord less signal set @	5.00
Kellogg No. 729 C. B. Oak wood hotel sets with straight line ringer, Booster Coil & etc. @	6.75
Leich Transmitters with back & Mouthpieces @	.90

REBUILT ELECTRIC EQUIPMENT CO.

1934 WEST 21st STR.
Pilsen Station
CHICAGO, ILL.

General Manager of the Division. Mr. Green plans to begin his work with Philco on February 1st.

"Appointment of Mr. Green as Assistant General Manager of the Philco Storage Battery Division reflects the rapid expansion of the Corporation's activities in the industrial storage battery field," Mr. Heinritz pointed out." Since the Division moved to a much larger plant at Trenton late in 1941, its production facilities have been increased threefold. As a result of Mr. Green's engineering training and extensive industrial experience, he will be of great help in making possible the further growth and development of the business, particularly as it contributes to Philco's war work."

Silver-lined Blackout Bulb

Designed for blackout lighting in air raids, the new Wabash Blackout bulb just announced by Wabash Appliance Corporation, Brooklyn, N. Y., provides downlighting in a soft beam of blue light that is safe for indoor visibility during blackouts. The bulb is lined inside with a pure silver reflector lining that hides all filament glare and projects the light downward. Light leaks are prevented by a black silicate coating that covers the bulb up to the extreme lighting end which is a deep blue. The new bulb consumes 25 watts and will list at 45c.

Copperweld Opens New Chicago District Office

The Copperweld Steel Company announces a change in its sales representation in the Chicago District, which comprises the states of Kentucky, Indiana, Michigan, Wisconsin, Illinois, Missouri, Iowa, Minnesota, North Dakota, South Dakota, Nebraska and Kansas. Heretofore Copperweld sales activities in these states have been handled by Steel Sales Corporation's Copperweld Department in charge of Mr. W. W. Ege.

Effective February 1st, Steel Sales

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WE BUY
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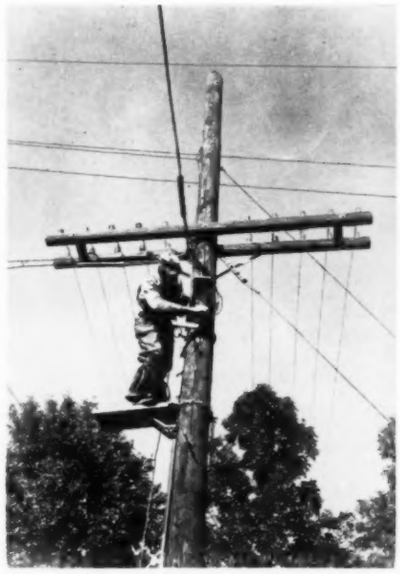
Daniel H. McNulty, Manager
Rogers Park Station Chicago

RECONDITIONED WESTERN ELECTRIC TELEPHONES
No. 1533 WALL PHONES
No. 1020-AL DESK STANDS
with
No. 534 BELL BOXES
(Rebuilt and refinished)
Write for prices.
Buckeye Telephone & Supply Company
COLUMBUS, OHIO

will no longer represent Copperweld and Copperweld Steel Company announces the opening on February 2nd of its own Chicago District Office at 122 South Michigan Avenue, Chicago, Illinois. Copperweld's Chicago District, including all the states listed above, will be under the supervision of Mr. W. W. Ege, who becomes Western Sales Manager for Copperweld. It was announced that Copperweld territorial representatives in the Chicago District will be as follows:

Mr. E. G. Elg, Mr. J. P. Gould, Mr. H. V. Rathbun, Mr. A. B. Leach, Mr. R. C. Raasch, Mr. J. J. Healy.

Pole Platform



A new Pole Platform useful in telephone construction work has been added to the A. B. Chance line. This is a low priced platform for use where linemen would otherwise be required to stand in their climbers for long periods, where working space is limited, or where maximum economy is desired. This platform is easily attached to the pole by the use of a single chain tightener. It is sufficiently strong to support the weight of one man and has been tested to loads of 850 pounds without breaking the board. This platform is available in 24" and 30" lengths.

A special short railing is made to provide additional safety. It assists linemen in maintaining balance and provides for freedom of movement while working. This pole railing is collapsible and easily applied.

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Quality by Of Top **UNIQUE**

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- **BALANCED LADLES**
- **SOLDER IRON HANDLES**
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- **FOLDING SAFETY SHIELDS**

Protect Public, Splicer, and Furnace. No. 50 C Shield shown here. Of 22 Ga. galvanized steel. Reinforced edges. 23"x17" x17". No. 50 — four-sided with grate. No. 50 A — same without grate.

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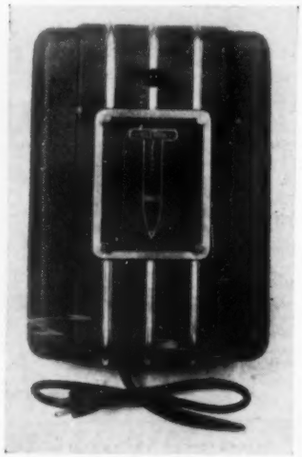
Reliable ringing service is essential in providing satisfactory telephone service.



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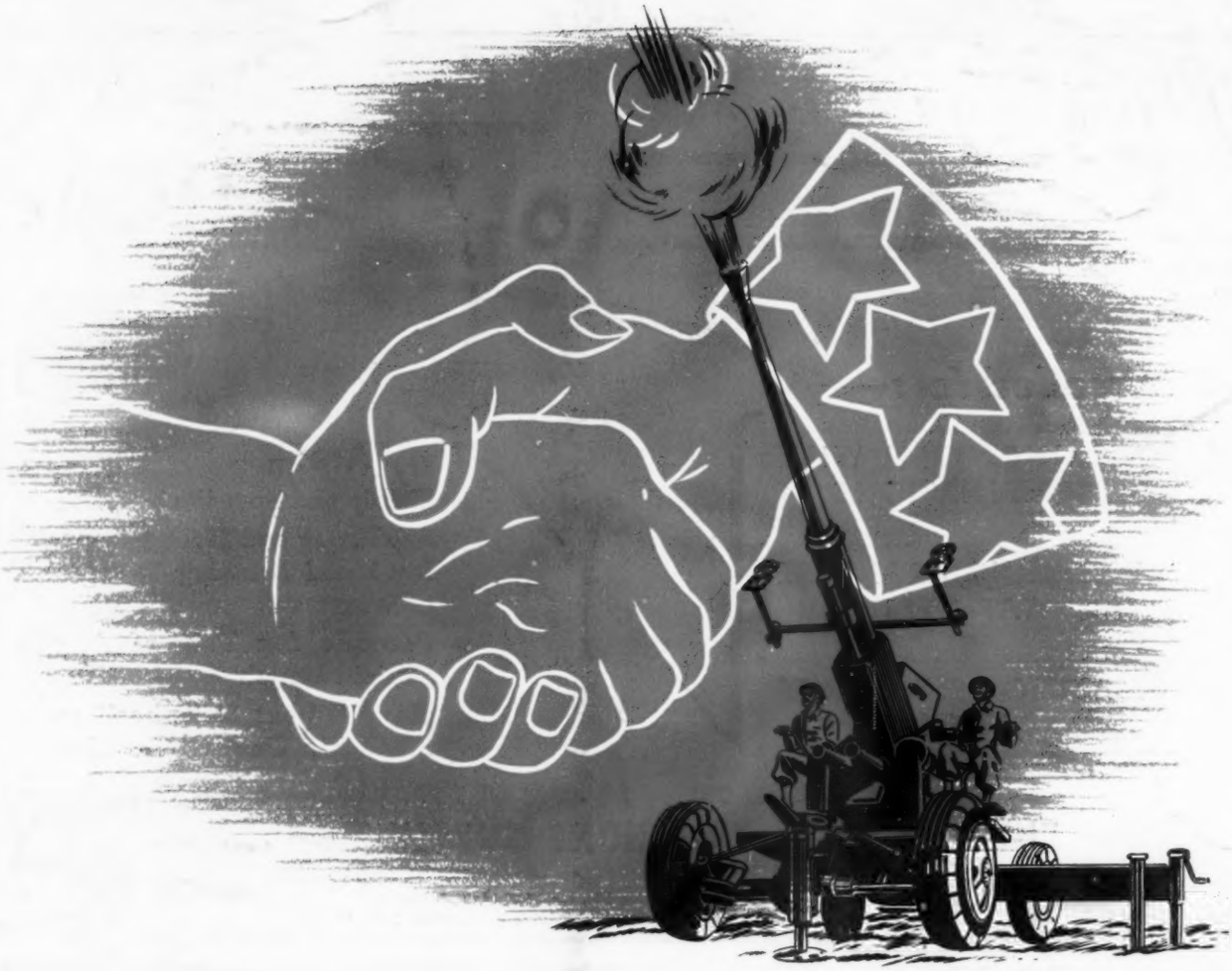

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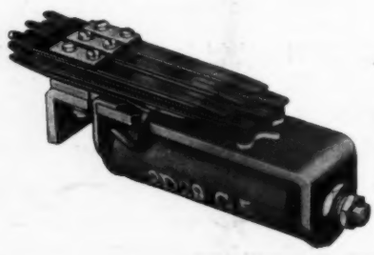
Galion, Ohio, U. S. A.



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